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AERIAL BOMBARDMENT AND INTERNATIONAL LAW

CONSTRUCTION PROBLEMS IN CHINA

CHINA NEEDS WORLD HELP

Vol. XXXIV SEPTEMBER, 1938 No. 9

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VOL. XXXIV SHANGHAI, SEPTEMBER, 1938 No. 9

Aerial Bombardment and International Law

(The following from The " Tokyo Gazette " is a statement of the Publicity Bureau of the Japanese Navy Department).

* * *

MANY have been the achievements of the air forces of the Imperial Navy in the present conflict with China ; aerial bombardment as an effective method of war has been proved to the fullest extent. This success in aerial operations has created wide repercussions throughout the world, calling to question the validity of the Japanese way of employing this new method of war in relation to the law of nations. The voices raised against Japan have invariably been based upon fabricated or exaggerated Chinese news and on their arbitrary reference to international agreements. It is our purpose here to attempt to clarify the thinking of intelligent people abroad on this problem peculiar to modern warfare.

Japanese air raiders, following strict instructions, have scrupulously confined their bombing to military objects. In Canton, for example, what have been made objectives of attacks are : Provincial and Municipal Government buildings, Provincial Headquarters buildings of the Nationalist Party, stations of the Constabulary, barracks of the 4th Route Army engineers, munitions and ammunition factories, cement mills, wireless stations, a munitions depot, an aeroplane repair shop at Tungshan, airfields at Tienho and Pakyün, Wongsha Station, and anti-aircraft batteries. Some of these structures cannot theoretically be classed as military establishments ; but the fact is that the Provincial Government buildings have been used as the military headquarters and the Municipal Government and Party Headquarters buildings have also been used for military purposes, a fact that the Japanese Navy has learned from reliable sources. As for cement mills, from the nature of cement as an essential war material they must be classified as munitions factories. Similarly, Wongsha Station, which is really a dump for all kinds of implements and materials of war and which constitutes at the same time an essential point in military transportation, cannot but be considered as a military object.

It has frequently been reported that Japanese naval air forces have bombed educational institutions. Schools and hospitals should not, of course, be regarded as objectives of bombing ; they are to be protected as much as possible. When, however, these institutions are used for military purposes, the matter assumes a totally different aspect. Accordingly, Article 25 of the Draft of Rules of Aerial Warfare prescribes :

. . . All necessary steps must be taken . . . to spare as far as possible buildings dedicated to public worship, art, science, or charitable purposes, . . . hospitals and other places where the sick and wounded are collected, provided such buildings, objects or places are not at the time used for military purposes. . . . .

As clearly seen among the ruins on the Shanghai front, the Chinese appear to make it a rule to employ these privileged institutions for essential military purposes, extreme instances being that school buildings appear to have been designed with military purposes in view.

Rules Regulating Aerial Warfare

What, then, are the Rules regulating aerial warfare ? There have indeed been fairly complete sets of international rules and agreements regulating conducts of belligerents in warfares other than aerial ones, such as treaties and declarations relating to chemical, bacterial, naval and land warfares, and those relating to neutrality which number approximately 19. With regard to aerial warfare, however, there have never been any definite rules internationally adopted. For in the days of the Second Hague Peace Conference (1907), when those important laws and regulations of war were arranged and adjusted, the progress in aviation that we are witnessing to-day was not even dreamed of.

In the Declaration Prohibiting the Discharge of Projectiles and Explosives from Balloons, which had been adopted at the first Conference of 1899 and was revised at the second Conference of 1907, it is stated :

The contracting Powers agree to prohibit, for a period extending to the close of the Third Peace Conference, the discharge of projectiles and explosives from balloons or by other new methods of a similar nature.

This Declaration still holds good to-day. Since, however, its Signatories are limited in number (Japan is not a party to it) and since the Declaration itself is in the nature not of authoritative but of provisional pronouncement, no signatory nation would refrain altogether from bombing from the air in adherence to this declaration, should there arise a war between themselves.

Article 25 of the Convention Relative to Land Warfare forbidding " The attack or bombardment, by any means whatever, of towns, villages, habitations, or buildings which are not defended " has been construed by some as rendering air raids on undefended cities illegitimate. According to the letters of this provision, such an interpretation may be warranted, but the circumstances in which this Convention came to be concluded will greatly modify its application. As a matter of fact, this treaty was revised at the same conference that adopted the above-mentioned Declaration regarding bombing from balloons. Is it not irrational, then, that one and the same conference should try, on the one hand, to declare totally against aerial attacks and, on the other hand, to make provisions for aerial attacks on defended cities ? Such being the case, Article 25 of the Convention cannot possibly be regarded as having in view aerial attacks by balloons and by other means. Be that as it may, it is impossible to try to circumscribe activities of modern aircraft by such antiquated, unimportant provisions. It must be concluded that no definite rules regulating conducts of aircrafts in time of war have been in existence as yet.

Accordingly, the Japanese Naval Air Force has been unavoidably regulating its conduct in consultation with the Draft of Rules of Aerial Warfare which was framed by a Commission of Jurists to Consider the Amendment of the Laws of War which met at The Hague in 1922-23 and in which Japan, the British Empire, the United States, France, Italy and Holland participated. The Convention Respecting Bombardment by Naval Forces in Time of War, which was signed in 1907, has also been referred to.

Following are the provisions in the Draft of Rules of Aerial Warfare having direct bearing on the present question :

Article 22.—Aerial bombardment for the purpose of terrorizing the civilian population, of destroying or damaging private property not of military character, or of injuring non-combatants is prohibited.

Article 24.—(1) Aerial bombardment is legitimate only when directed at a military objective, that is to say, an object of which the destruction or injury would constitute a distinct military advantage to the belligerent.

(2) Such bombardment is legitimate only when directed exclusively at the following objectives: Military forces; military works; military establishments or depots; factories constituting important and well-known centers engaged in the manufacture of arms, ammunition or distinctly military supplies; lines of communication or transportation used for military purposes.

(3) The bombardment of cities, towns, villages, dwellings or buildings not in the immediate neighborhood of the operations of land forces is prohibited. In cases where the objectives specified in paragraph 2 are so situated, that they cannot be bombarded without the indiscriminate bombardment of the civilian population, the aircraft must abstain from bombardment.

(4) In the immediate neighborhood of the operations of land forces, the bombardment of cities, towns, villages, dwellings or buildings is legitimate provided that there exists a reasonable presumption that the military concentration is sufficiently important to justify such bombardment, having regard to the danger thus caused to the civilian population.

(5) A belligerent State is liable to pay compensation for injuries to person or to property caused by the violation by any of its officers or forces of the provisions of this article.

Article 25.—In bombardment by aircraft, all necessary steps must be taken by the commander to spare as far as possible buildings dedicated to public worship, art, science, or charitable purposes, historic monuments, hospital ships, hospitals and other places where the sick and wounded are collected, provided such buildings, objects or places are not at the time used for military purposes.

The point to be noted in these provisions is the abandonment of the conception of "defended" and "undefended" as the test of legitimacy in aerial bombardment, which is clearly pointed out in the report of the Commission as follows:

It will be noticed that for aerial bombardment the test adopted in Article 25 of the Land Warfare Regulations, that of towns, etc., being defended, is abandoned. The nature of the objective or the use to which it is being put now becomes the test.

The British draft submitted to the same Commission stipulated:

Aerial bombardment is legitimate only when directed at a military objective. Its legitimacy depends, not on the fact that a town or other places is "defended," but on its constituting even temporarily a military objective.

The American draft also made no distinction between the defended and undefended towns. In these views the Japanese draft was in agreement.

"Defended" and "Undefended"

That the test adopted in the aforementioned provisions in the Land Warfare Regulations of defended towns has been abandoned and that the test of the nature of the objective or the use to which it is being put has been adopted instead in the Draft of Rules of Aerial Warfare are not merely rational as a general step but also admittedly valid as applied particularly to aerial warfare.

Those censuring Japanese bombing, however, invariably say that undefended towns have been raided. The Resolution adopted by the Far Eastern Advisory Committee of the League of Nations on September 27 also condemned air attacks "on open Chinese cities" by Japanese naval air forces and declared that there was "no justification for such methods of warfare." Recent raids on Canton have given occasion to similar opinions. Such condemnation comes from the views dominated by the old idea of open or undefended towns, the views which will prove to be extremely perilous to the attacked. If the legitimacy of indiscriminate attacks on defended towns is maintained according to the old conception and if the vague, undefinable idea of defended and undefended towns is adhered to, the attacked will inevitably be placed in a most precarious position.

Further analysis of the idea of defended and undefended towns will clarify the question. Some hold, in this connection, that a town is defended when it has either the establishments or fighting strength to prevent its occupation by an enemy force. Others object to this view of placing the emphasis on the defensive strength against the hostile occupation on the ground that in case of bombardment of towns by naval forces they will not infrequently bombard the coast line of the enemy country for the purpose not of occupation but of destruction only. And either of these views gives rise to the question as to what is the minimum size and strength of the existing defensive works and fighting forces by which the town can be called defended. The question has to be left practically to the judgment of the commander of the attacking force. When the same question is applied to aerial attacks, its vagueness and undefinability increase all the more.

Since there will be no modern cities of importance which are left totally undefended against attacks by land, sea or air forces in respect of its defensive works or fighting strength, any one of them may be considered as defended. And once the city is deemed defended, the attacker is entitled to act indiscriminately by bombarding any objects in it regardless of whether or not they are of military character. As a matter of fact, in the British and American Rules of Land Warfare it is provided that in bombarding defended towns the objectives need not be confined to defensive establishments such as the fortress and troops. It follows, therefore, that the conception of "defended" and "undefended" will prove to be a menace to the attacked. The much talked-of undefendedness of Canton and Hankow, in this connection, is totally unwarranted; they are defended cities in all respects. In particular, Hankow as seen from the point of view of naval warfare can be regarded as a defended city simply on the ground that mines are laid outside its harbor. Consequently, Japan would be justified, according to the test adopted by her critics with regard to the status of defended and undefended towns, even in resorting to indiscriminate bombardment. An instance of the attack on a purely undefended town has been found in the French bombing of German health resorts having no military significance, an act which was carried out during the World War as one of reprisal.

The British view that an exception should be made of aerial bombardment of certain isolated regions for police purposes expressed on the occasion of the plenary session of the Disarmament Conference at Geneva when the question of entire abolition of aerial bombardment was taken up will serve as a further example of the irrationality of condemning Japan on the part of Western nations with regard to this new method of war. As British Delegate, Mr. Anthony Eden made a statement to the following effect:

It was well foreseen that the proposal of making such an exception would meet with objection. Aerial bombardment of this sort has been already made in some mandated regions to the knowledge of the League of Nations but no comment has yet been heard about it. In some parts of the world, because of their terrain or of the wide dispersal of the inhabitants, or because the violent-tempered inhabitants imperil the good inhabitants in the neighboring areas, large military forces would always have to be kept and many lives would be sacrificed in times of disturbance, if aerial bombardment were not possible. Therefore, Great Britain, although she desires to make the prohibition of aerial bombardment absolute and general, had to insist upon an exception such as the above.

Accordingly, the recent bombings of native inhabitants in Northern India, most relentless aerial attacks, were doubtless carried out as a matter of course.

Endeavoring to Minimize Danger to Civilians

So much for the theoretical analysis of Japanese attacks from the air. A few more lines may be pertinent here, however, by way of explaining how Japanese aviators have actually endeavored to minimize dangers for civilians.

When the airmen were starting on the attack, the commander would never fail to give them full instructions, calling for strict obedience to orders and indicating clearly the objectives of their attack. Moreover, the commander would call their attention not to cause destruction to civilian and foreign life and property, instructing them to stop bombing in case of possible danger of causing such destruction. There have been scores of cases in which Japanese aviators came back without discharging bombs from the air over the cities to be attacked on account either of failure to definitely mark out the objectives or of the possible heavy destruction of civilian life and property. To have issued warnings, to have given notice of intended attacks, to have flown low so as better to ascertain the objectives—all these give evidence of how sincerely the Japanese Naval Air Force has made efforts to safeguard non-combatants.

One final point. In treating of any actual acts of fighting, one must not reckon without human limitations. However sincere they have been in their endeavors and however excellent they have been in their marksmanship, Japanese aviators are human, and as such they have not been entirely free from errors. Thus, unfortunate incidents have occurred and unaccountable destructions have been caused. Such incidents, which occur, in part, from the nature of modern warfare, are greatly to be regretted.

Construction Problems in China

(The Oriental Economist Supplement, August, 1938)

WITH the Sino-Japanese struggle now entering the third stage, the Japanese nation is becoming growingly conscious that the task in which it is engaged is in reality a gigantic work of continental construction and not the conventional war of death and destruction. This was fittingly described by Army Minister Seishiro Itagaki in the following words:

"The people of Japan must not look upon the present China conflict in the conventional light of a war of destruction. Rather the viewpoint should be that we are now engaged in a continental building program which necessarily requires a long period of time to finish. If it were a war pure and simple, the question would arise as to just when it would come to an end, but since it is a work of construction carried on over an extended period of time, one waits with hope for its results. The longer the struggle lasts, the nearer do we move toward the goal. The fruit of this gigantic undertaking will be greater political power and a magnified fighting strength for this nation."

As Japan's economic powers will thus be exerted not alone for war but also for the building program on the continent, it will not be inapt to survey her plans and examine her economic resources and capacity in order to determine whether they are equal to the task that has been set before her.

The question that will be asked immediately is how will Japan acquire the vast amount of capital and supplies required to carry out such an extensive program. The capital that will be needed in the next five years to develop North and Central China is roughly estimated to be in the neighborhood of Y.1,700 million, in the respective proportions of Y.1,500 million and Y.200 million. If this were the only activity requiring Japan's attention it would be easy enough, but the nation will also have to spend more than Y.7,000 million for military and other operations in North and Central China and in addition funds estimated at between Y.5,000 and Y.6,000 million for opening up Manchuria's industrial resources. The grand total of required capital reaches an immense figure, but granting that it can be raised without undue difficulty there remains the necessity of acquiring the supplies which are also essential to the development and building work. The whole problem boils down to Japan's capacity for investment and production.

To pave the way for economic construction, a foundation must be laid in the form of a currency system for North and Central China and closely connected with it a system of trade and foreign exchange control must be established, but even prior to this foundational work, efforts must be made to eliminate the difficulties arising from the presence in Shanghai, Tientsin, and elsewhere of banking firms of nations other than Japan and China. Japan's position in this situation and the measures she intends to take are matters of great interest.

Preparations are under way to organize two semi-Government institutions named the North China Development Corporation and the Central China Promotion Corporation, which will function as the nerve centers directly controlling the complex activities involved in the reconstruction and development of the two regions. They are scheduled to hold their first general meetings of shareholders simultaneously, late in October, and to start business early in the following month. As each company is a special organization to enforce high State policies, the task of forming them was assigned to a very prominent leader, namely Baron Seinosuke Go, who is chairman of the committees in charge. As soon as the necessary legal formalities are completed and the corporations actually brought into being, Mr. Sonyu Ohtani, former Minister of Overseas Affairs and now, a member of the Cabinet Council, is expected to be made chairman of the North China concern and Mr. Kenji Kodama, former president of the Yokohama Specie Bank, chairman of the Central China firm.

With an initial capital stock of Y.350 million, of which half will be contributed by the Government, the North China Development Corporation's chief field of activity will be the investment in or the granting of loans to the principal enterprises in certain lines with a view to consolidating and co-ordinating the management and operation of these projects. The lines include transportation and harbor facilities; communications; power development and transmission; mining; salt recovery, distribution and utilization; and other enterprises which require fusion or the logical adjustment of their relationship to improve the chances of North China's economic development.

The North China Corporation is, therefore, an investment or holding company which will not interest itself directly in any scheme for the development of resources or in the operation of communication systems or transportation lines. These activities will be entrusted to its subsidiaries, which will be joint Japanese-Chinese enterprises each specializing in a single activity. As a matter of principle all lines not specified above will be free to development by anyone.

The activities implied by the term "development of North China" center about the opening up of such mineral and other resources as iron, coal and salt, of which Japan's natural supply is limited. In order to achieve these purposes plans are already being made to build railways, water transportation systems, terminal and harbor facilities, power generating and transmission systems, and for other fundamental projects, all of which, as pointed out above, will come directly under the control of subsidiary firms. The capital needed to finance the schemes is estimated at Y.1,420 million, to be expended during the next five years. The North China Development Corporation is expected to provide Y.879,500,000 in the form of investments or loans and the balance is to be raised by the subsidiaries themselves.

It is intended to draw the capital needed for the subsidiaries from only a few sources. That for the transportation project for example, will be supplied by the South Manchuria Railway Company, that for the power schemes by the Electric Power Alliance, that for coal mining by the Japan Colliery Association, that for coal liquefaction by The Teikoku Fuel Industry Company and that for salt recovery by the Japan Bleaching Powder Association. Even in the fields where free competition is allowed, the North China Development Corporation is authorized to invest in or grant loans to a few industries which are of importance to national defense or of industrial importance, such as gold mining, light metals, sulphate of ammonia, cotton culture, etc.

TABLE 1.—NORTH CHINA CAPITAL REQUIREMENTS

(In million yen)

Transportation and harbor facilities	447
Communications (telegraph, telephone, radio broadcasting)	34
Power generation and transmission	144
Mining:	738
Iron and steel	141
Coal	131
Coal liquefaction	466
Salt recovery, distribution and utilization	36
Other	24
Total	1,423

As in the case of the North China firm, the Government is to provide half the Y.100 million capital stock of the Central China Promotion Corporation. Beside investing in and granting loans to projects in certain lines, the corporation may, with the special permission of the Government, operate these projects for its own account and risk. The lines with which it is concerned are transportation, communications; electric, gas and water supply utilities; mining, fisheries, and other activities necessary for the public interest and industrial promotion in Central China.

A notable feature in which the Central China corporation differs from the northern firm is that particular stress is laid on reconstruction of the central region. This is essential because prior to the outbreak, the economy of Shanghai and the surrounding territory had attained a well defined degree of development. The immediate objective of the Promotion Corporation therefore will be to restore the war ravages, and it is calculated that three years may be required to complete the task.

As in the case of North China Development, subsidiary companies will be entrusted with the direct undertaking of various industrial activities. Their combined capital stock is expected to reach Y.190 million of which Central China Promotion will contribute Y.50 million, but the holding concern may require an additional Y.115 million in the next five years for loans and investments to finance business expansion and for launching new projects. The capital requirements of the two holding corporations for the five year period are given in Table 2.

TABLE 2.—TWO FIRMS' CAPITAL PROGRAMS

(In Y.1,000)

*Fiscal year**	*North China Development*	*Central China Promotion*	*Both*
1938	94,050	30,000	124,050
1939	284,710	20,000	304,710
1940	181,720	20,000	201,720
1941	198,540	25,000	223,540
1942	120,500	20,000	140,500
5-years	879,520	115,000	994,520

*Same as calendar year.

The establishment of new currency systems is being urgently demanded as essential to the economic upbuilding of North and Central China, but of course this is proving no easy task. On March 10, the Reserve Bank of China opened its doors for business. North China was taken into the yen currency bloc and the new bank's notes were made exchangeable at par with Japanese yen, but the results have been unexpected currency complications throughout the Japanese occupied areas.

The problems that called for immediate solution were the restriction of Japanese exports to North China and the checking of a decline in the value of Japanese yen notes at Shanghai. Inasmuch as North China was now in the yen currency area, Japan's exports to that region not only failed to acquire foreign exchange but also accelerated the upward trend of commodity prices in Japan by aggravating the undersupplied condition. The position is now taken that trade and foreign exchange control should be introduced in North China also, but the efficacy of such measures is rendered doubtful by the existence there of banks of other foreign countries.

In Shanghai the yuan is worth Y.90 and its arbitrated rate on London is fluctuating between 8d and 9d. In North China, as it is exchangeable at par with Japanese yen, the reserve note ought to buy 1s. 2d., but actually foreign banks in the Tientsin settlements are buying export bills at around the Shanghai level with the result that the bulk of these bills is flowing to foreign banks. By reason of these conditions Japan is virtually denied the opportunity of using North China products.

Such a development is a natural sequel to the policy hitherto followed of maintaining the yen-yuan parity and the inviolability of the rights and interests of third powers. How these difficulties are dealt with will have an important bearing on the progress of the economic rebuilding program for both North and Central China.

China Needs World Help[*]

By SADAKI FUKUMOTO

How Japan and China can live and let live in harmony is a problem which has claimed my interest for many years and which provided an interesting background for observation during a recent trip to North China. As a businessman and former managing director of the Yamasita Steamship Company operating one of the largest tramp ship businesses in the world, I have naturally viewed Sino-Japanese relations fundamentally from the economic standpoint, but not to the exclusion of political and other aspects. The not frequent anti-Japanese movements of the past invariably injured or threatened to injure business and this automatically drew my attention to Chinese political affairs and brought me into contact with many influential Chinese.

My recent trip lasted from May 7 to June 25 and included visits to Tientsin, Peking, Chefoo, Tsingtao and other cities. On this occasion again I was traveling primarily to inspect business conditions but was brought into touch with other aspects of the Chinese situation.

My opinion of China as a general problem can be expressed in a comparatively few words. The Chinese people, comprising one-fourth of the entire world population suffer from a standard of living which is so low as to be unbelievable unless actually seen at first hand and which demands consideration for purely humanitarian reasons if nothing else. Their predicament was aggravated by many years of maladministration on the part of the Manchu dynasty and was not a bit improved by the revolution. More recent conditions have been even worse. The so-called "Soong dynasty" a private clique with Chiang Kai-shek at its head, has administered politics for its private benefit. It has bled the people white, forcing them to pay taxes 10 to 20 years in advance and otherwise impoverishing their sources of living.

It is my belief that the entire world would benefit if the living conditions of China's 450,000,000 could be improved. Assume that the national earnings were increased by only Y.10 a month per capita and the annual purchasing power of the Chinese would rise by nearly Y.60,000,000,000. Even one-third of this gigantic sum would suffice to cure the world's economic depression by peaceful means. The living standard of the Indians and other colored races would be elevated, and the world-wide return of prosperity, from which the culturally advanced nations of Europe and America would benefit the most, would automatically eliminate the threats of war which haunt the minds of the world's statesmen. Japan would, of course, reap her full share of the benefits, probably to the extent that there would be an alleviation of the population pressure which now constitutes one of her most serious problems.

Logically the Chinese living conditions should have a potential power to work economic harm as well as economic good, and unfortunately they have developed in the undesirable direction for many years past. Consequently, China's politics was reduced to a terrible tangle and the situation eventually gave indications of getting entirely out of control.

Only Way Out

On my recent trip I found much evidence that China had reached the brink of the abyss before July, 1937. At Peking a Chinese politician who is no longer very active told me that if the China Incident had not occurred, Chiang Kai-shek would have crashed because his administration had failed to improve the popular living conditions. Chiang saw that the only way to maintain his political influence was to fight Japan, said the politician, and it might well have been that Chiang continued to resist Japan deliberately even while the Japanese were attempting to prevent the original trouble from developing into serious proportions.

A Japanese army officer while dining with General Shih Yu-san early in July last year was told by Shih that the Japanese and Chinese soldiers were already fighting. The officer laughed, but on the next day, July 7, the Lukowkiao incident occurred. General Shih, who was then regarded as a pro-Japanese officer, commanded the peace preservation corps at Peking numbering 7,000 men, while General Sung Che-yuan was in command of 100,000. It is believed that Chiang Kai-shek's instructions to challenge the Japanese soldiery were delivered to Shih Yu-san one day after they had been sent to Sung Che-yuan. Incidentally, I learned of this episode directly from the Japanese officer who dined with General Shih.

Such evidence suggests that Japan has been placed in a false position by the present hostilities—that she is fighting and expending her national strength to the end that the Chiang Kai-shek administration may continue to exist. Consequently, Japan's only course is to push the hostilities to a full conclusion as swiftly as possible and thus bring to an end the undesirable expenditure of national resources.

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[*] In *Contemporary Japan.*

As long ago as 1936 I was warned by a man closely connected with Chiang Kai-shek's private secretary that China was going to fight Japan. The wealth of evidence that is available leaves no doubt, in fact, that the Lukowkiao incident was prearranged by China and occurred according to the Chinese program. It may seem trifling to discuss responsibility for the hostilities at this time when they have reached such serious proportions ; but knowledge of the causes and of where the blame lies is indispensable to anyone desiring to know the real situation in China. A lack of this knowledge has frequently led the European and American nations into the error of blaming Japan without good reason, and their attitude is advantageous neither to themselves nor to China.

Frank Talks Wanted

Paradoxically, China suffers from the speech of those who speak well about her. The Christian missionaries, who ought to be thoroughly familiar with conditions there, are afraid to discuss them frankly abroad because to do so would be to invite immediate pressure from the provincial military authorities. Pressure would interfere with, if not prevent, the propagation of the faith which is the business of missionaries, and might lead to the loss of their jobs, so to speak. Consequently the missionary's opinion of China is likely to be expressed in such a way as not to arouse official antagonism, and it is therefore difficult to obtain a true picture of conditions in China from their descriptions. This is true not only of the missionaries but all others who have more or less direct interests in China that might be injured if the holders were relentlessly to expose internal conditions to the outside world. Lacking the true facts and possessing only carefully expunged versions of Chinese conditions, most foreign peoples are led to accept the National Government's propaganda as the truth with the result that misguided policies are adopted which result in misfortune to the welfare of China's people.

An aspect of North China conditions which impressed me during my trip was the strictness with which control is being exercised over Japanese residents. At Peking the Japanese Army rigidly supervises the entrance of its own nationals, even to the point of apparent " pressure," while the nationals of other countries seem to have freer access to the old city. The main railway station is open to the Japanese, but the Suimenkow Station, offering a short cut to the Legation Quarter, was closed to them when I visited the city, although foreigners could go back and forth through it. A Japanese who visits Chefoo or Tsingtao must carry certificates issued by the Japanese Army showing his *bona fida* status. My criticism of the Japanese authorities is, in fact, based on their vigorous policy in this respect, and I think they could be more liberal in permitting the entrance of Japanese into North China, particularly as they are able to deport any Japanese nationals who may prove undesirable.

During my stay at Chefoo all was quiet, although there was talk of Chinese fugitive soldiers who were still hiding in the nearby mountains. The Chinese residents were enjoying stabilized conditions of living. A Chinese banker told me there was no feeling of uncertainty about life or property, thanks to the protection given by the Japanese, and that the only trouble at present was a lack of business connections with South China. Chefoo is being guarded chiefly by a Chinese peace preservation corps commanded by a Japanese officer, and it is noteworthy that the company commanders, all of whom are Chinese, are genuinely assuming the responsibility of maintaining guard over the city.

Keeping Peace

At Tsingtao the Japanese Navy is effectively keeping peace and order as is shown by the gradual return of the Japanese residents whose number is almost equal to what it was before they evacuated the city last year. Tsingtao is rapidly rising from its ashes as reconstruction makes steady progress.

One of the problems in North China is the menace of fugitive soldiers and bandits who lurk outside most of the cities and carry on depredations, partly upon orders from Chiang Kai-shek and partly as a means of existing. When the Chinese armies were defeated these soldiers lost their jobs and became fugitives, but they retained their weapons and constitute a danger to law-abiding persons from whom they can wrest money and food. Appropriate steps will be taken against them, probably as was done in Manchoukuo where the number of soldier-bandits has been reduced from about 300,000 just after the Manchurian Incident, to about 10,000. Five years of post-Incident campaigning was necessary to rid Manchoukuo of the pests, and they probably will not disappear entirely until conditions are completely stabilized. The fundamental solution of the bandit problem in both Manchoukuo and North China is economic rather than military. The best way of eliminating them is to give them jobs as conditions improve, and eventually their number will become too small to cause any concern even in districts distant from the railways.

It is of course impossible to predict the development of the China Incident itself, especially for one who is not concerned in its direction. It is true, however, that Japan is fighting, not the Chinese people but the Chiang Kai-shek regime whose overthrow is the ultimate objective, and I presume that the incident will come to an end when the objective is achieved. What the Chiang Kai-shek regime is, and what it has done to the Chinese people were vividly described to me by General Li Tsung-jen (defense commander of Hsuchow), with whom I discussed Chinese affairs in 1935, first during a 20-day stay at Nanning in Kwangsi Province and later at Canton. General Li was harshly critical of Chiang's character, and though he opposed Japan's actions in Manchuria he observed that the Manchurian Incident might well have been brought about because Chiang's politics were enough to provoke Japan into taking up arms against China.

Of Chiang's untrustworthiness General Li spoke with extreme disgust. General Li and General Pai Tsung-hsi both rendered the greatest service in the achievement of the second revolution, but despite this Chiang attempted to murder them and they were forced to flee to Canton for safety. Thereafter they naturally bore a grudge against Chiang.

Perhaps the most surprising thing General Li told me was that Chiang Kai-shek's anti-Communist campaigns in a vast interior area were in reality a blind. Chiang's true purpose in sending troops to the provinces, General Li said, was to sap the military and economic strength of the provincial war-lords, and while ostensibly fighting the Communists he was in reality ever effecting compromises with the Red Armies. Li himself suffered from these activities, for Chiang led his own and Communist troops into Yunnan Province and stopped the Yunnan opium revenue from going into Kwangsi Province, which was controlled by Li. This was typical of Chiang's usual tactics, which were to bring pressure on a political adversary.

Soong Dynasty

The so-called Soong dynasty, involving Chiang Kai-shek, Sun Fo, H. H. Kung and T. V. Soong, was worth three years ago about 1,000,000,000 yuan, which had been amassed by diverting the political administration to their own interests and by other corrupt political practices. At that time General Li, who had performed great service in the second revolution, was living in a borrowed house and said he would continue to do so until he could obtain more money. The manner in which Li was thrust into the mire by Chiang was genuinely tragic.

China will face vastly better prospect after the Chiang regime has been crushed. Her people, though known for their collective weakness, are likewise noted for their individual strength and ability which, if properly directed and utilized under Japanese leadership and with Japanese co-operation, will place Chinese economy on an independent basis. China's agricultural capacity is very low compared to that of Japan, and its agricultural methods are primitive. With proper direction the agricultural production alone could be increased three times, and the corresponding increase in the people's buying power would mean the purchase not only of more Japanese articles but of more goods from the United States, Great Britain, Germany and other countries. The immense cultivable area is sufficient, if properly utilized, to supply all of China's own needs, and in addition she has immense natural resources of other kinds which it will be to the world's advantage to develop. And even a basically self-sufficient China will continue

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Japan's Friendship for America*

By ERNEST O. HAUSER

AMONG the people of Japan the United States to-day is probably the most popular of all foreign powers. A quick glance at Japan might not bear out this fact. In Tokyo for instance, there is evidence everywhere of the Japanese friendship for Italy and Germany. The swastika and the red-green-and-white of the Italian flag seem to have been raised to almost the equal of the Rising Sun. Cheap pictures of Hitler and Mussolini are for sale in shops, and books promising a swift, easy knowledge of German are conspicuous on the shelves of the open book stores. The magazines feature Germany and Italy in their illustrations and German classes have been added to school curricula.

But this is a superficial enthusiasm, as more intimate contact with the Japanese people reveals. In Japan, as in other countries ruled by a more or less authoritarian government, it is easy to stage "popular" demonstrations. The rulers of Japan have seen the present emergency as a fit occasion for new emphasis on the Tokyo-Berlin-Rome alliance. The propaganda campaign, meant to convince the people of the tangible value of this alliance, has succeeded in rippling the surface. But it has not penetrated to the depths.

Look to America

For, despite the intensity of this government-sponsored publicity, and despite the apparent insignificance of America's place on Japan's political horizon, the Japanese public continues to look across the Pacific for international stimulation. As a matter of fact, the interest in America has always been an integral part of Japan's public mind, and this organic connection may be responsible for the lack of conspicuous manifestations. The reasons for the unique place occupied by the United States in Japanese public opinion are historic and geographic.

It was an American, Commodore Perry, who first caused the opening of Japanese ports to the outside world in 1853, and America played an important rôle in the subsequent Westernization and industrialization of Japan. Japanese businessmen went to the United States in increasing numbers. The World War saw America fighting on the same side as Japan. After the war, Japanese friendship for the United States reached a climax when millions of American dollars were handed over to the victims of the 1923 earthquake as a spontaneous gift from one people to the other.

More recently the lack of imperialist ambitions in American Far Eastern policy has done much to stimulate appreciation and friendship, while the steady flow of trade furnished solid basis for sympathetic sentiments. Japanese silk, the staple product of the Japanese countryside, was shipped to the United States in specially constructed fast freighters, and American cotton was used in the factories of Tokyo and Osaka.

But were these developments important enough to shape public opinion in Japan ? To answer this question it seems necessary to examine the formation of Japanese public opinion with regard to foreign countries. Ever since the beginning of the so-called Meiji restoration, foreign patterns have been introduced into Japan, and these patterns have reached all strata of the population. Experiments and inventions made in foreign countries were used to build up domestic industries, a political machinery and an up-to-date army. As a natural consequence of this universal penetration of a foreign civilization into the body of ancient Japan, the Japanese people learned to think in terms of international relations to an extent unknown in any other country of the world.

Throughout the entire period of Japan's modernization the Japanese window was opened to the east. And looking through this window, straight across the Pacific Ocean, Japan was facing the United States. Japanese emigrants went to California to settle there for good ; Japanese students went over to work in American factories, to graduate from American universities. The widespread use of the English language contributed its part toward a feeling of intimate neighborhood. In fact, English is subconsciously accepted as the American language, and people tend to forget that it happens to be spoken in the British Isles too.

This attitude has been prompted, to a certain extent, by the triumphant march of the American movie. The Japanese public has come to accept our movies as popular standard entertainment. Besides, American bars and American cabarets have sprung up in the amusement quarters of the big cities. American baseball scores are received with genuine enthusiasm, and the United States accounts for half of the scenes shown by Japanese news reels.

American Influence

Japanese women have copied American dresses and American make-up to the same extent as their husbands have copied American business methods. People are familiar with the names, faces and personal histories of American film stars, politicians and businessmen. American literature of every shade, from detective stories to economics, is translated into Japanese, and the Japanese public has turned even to American interpretations of neighboring China, such as the novels of Pearl S. Buck.

As a result of all this, the Japanese know a great deal about us, while we still know very little about Japan. America, throughout its history, has been looking across the Atlantic rather than across the Pacific Ocean, and the ties of race, history and language have continued to focus American attention upon Europe. Little consideration was given to Japan and to Japanese feelings, and the Japanese immigrant, who sneaked in through our Pacific back door, was taken as a curiosity and later on as a nuisance. Shortly after the Tokyo earthquake, when Japan looked upon generous America with an unprecedented measure of admiration and friendship, the American Government passed the Exclusion Act, which closed the door in the face of Japan.

Japan's potential emigrants were less offended than the Japanese intelligentsia. In fact, there are intelligent and sober-minded Japanese who trace the roots of the present Far Eastern war right back to the attitude of the American Government, which threw Japan's excess energies, both mental and physical, back to the continent of Asia.

There have been other disappointments, to be sure although none of them have met with an equally deep emotional reaction. Our attitude during the conquest of Manchuria in 1931-32 is remembered with much anger, and the former Secretary of State, Henry L. Stimson, continues to be the most unpopular of all Americans. In contrast, the present administration seems to enjoy an extraordinarily high popularity. President Roosevelt is pictured as an idealist—and the Japanese have much appreciation for genuine idealism—while Secretary Hull is considered a very able statesman. The neutrality observed by the United States in the present Far Eastern turmoil is taken as indicative of our non-imperialist and peaceful aims in the Far East. This policy is contrasted with British and French imperialism, and the United States emerges as the most popular foreign power.

This sentiment is not entirely of our making, however. Japanese censorship has helped a great deal to build it up, involuntarily. Reports concerning American indignation about Japan's aggression, anti-Japanese articles which appeared in the American press, and the beginnings of an anti-Japanese boycott were carefully withheld from the Japanese public. The same holds true, more or less, for strong references to treaty violations made by President Roosevelt as well as by Mr. Hull, and it seems that the personal admiration of the Japanese correspondents in Washington for Mr. Roosevelt has a great deal to do with the "good press" which he continues to get on the other side of the Pacific Ocean.

But censorship in Japan is not air tight and the Japanese have found out that the American public does not approve everything they have done in China. The reaction, however, is regret rather than indignation, and the feeling prevails that we "misunderstand" the true motives of Japan.

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* From the *New York Times*

American Public Opinion and Japan*

By CHARLES NELSON SPINKS

SINCE the Russo-Japanese War considerable American attention has been focused on Japan and her Far Eastern policies. Many factors have contributed to the formation of this opinion which has varied from sympathy to hostility, representing at times merely group sentiments and again nationwide manifestations of approval or condemnation. Two American scholars have just completed a remarkable analysis of these reactions and have presented a comprehensive record of what the American public has thought about Japan and Japanese-American problems during the past thirty years. In view of the present Far Eastern conflict an understanding of the forces which have molded the American attitude toward Japan is of supreme importance for the future guidance of relations between the two countries.

In the years immediately following the Russo-Japanese War American opinion shifted from a definitely pro-Japanese attitude to one of suspicion, resentment, and even hostility. By 1905 both the United States and Japan had become great Powers. This fact alone destroyed much of the adolescent and romantic affection which had formerly existed between them, while industrialization and the necessity for economic expansion brought both countries into a more realistic contact with each other. As they reached "national maturity" they became economic rivals for the resources and markets of China. This significant transformation occurred when Japanese emigration to the United States first became a problem on the Pacific Coast, and both developments were fused into a force which produced the first anti-Japanese attitude in the American mind.

Immigration Problem

The immigration problem resulted from agitation in California against Japanese settlers, producing discriminatory legislation and a demand for outright exclusion. After a twenty-year campaign the main objective was achieved by the Japanese exclusion provision in the national Immigration Act of 1924. The movement for Japanese exclusion was composed chiefly of labor groups, nationalistic organizations, sensational newspapers, and politicians in search of political capital. American labor throughout the nation supported the movement, largely because of its hostility toward any further European or Oriental immigration. But the main agitation came from the regions in which Japanese settled, especially California, and was a mixture of labor politics, nationalism, and race prejudice. Anti-Japanese sentiment on the immigration question was largely a regional and partly an occupational expression of opinion. For the most part the rest of the country was not in sympathy with the program of the California agitators, and even in that State opinion was far from unanimous. Many business men interested in Far Eastern trade along with farmers who desired cheap, reliable agricultural laborers opposed exclusion, while practically every church organization and intellectual group condemned racial discrimination.

The extent to which opinion was divided is clearly shown by the fact that the movement which has grown up to substitute a quota system for the exclusion provisions of 1924 originated in California, which has remained at the same time the center of opposition to any change in the present immigration laws. Even the passage of the Immigration Act of 1924 by the national Congress does not contradict the fact that the movement for Japanese exclusion was essentially limited to the Pacific Coast. The publication of Ambassador Hanihara's unintentional "grave consequences" letter to Secretary Hughes in protest against discriminatory exclusion unfortunately changed the whole issue, enabling the exclusionists and the nationalists to magnify the incident into a "war threat" which influenced many who had previously not favored the exclusion bill.

It is also of significance that the labor and nationalistic organizations which championed the cause of exclusion have become anti-Japanese in other respects. Since their goal was achieved in 1924, they have, in many cases, taken the lead in agitation against Japan for other reasons. This has been particularly so in the case of the labor groups, which at the present moment are most active in trying to organize an anti-Japanese boycott. It can truthfully be said that for one reason or another American labor has been consistently anti-Japanese.

Support Open Door

In the case of the economic rivalry which developed between the two Powers, American opinion has been more unanimous and less regional in not only its support of American policy in the Orient, but in its criticism of Japan as well. Japanese expansion on the Asiatic mainland has always aroused American business groups with actual or potential economic interests in the Far East. Many other Americans with no tangible interests have believed that Japan's expansion must be at China's expense. They at once adopt a pro-Chinese attitude in any dispute which arises. Thus most of the anti-Japanese expressions as a result of this issue have represented both an economic and a sentimental reaction. At the same time the great majority of American opinion has supported the American government in its Far Eastern policies, especially with regard to the Open Door and the preservation of China's integrity. American opinion has likewise supported most of the attempts to expand American economic interests in the Far East, for even the far-reaching proposal of Secretary Knox in 1910 for the neutralization of the Manchurian railway system received practically nation-wide approval. There has, however, been a sharp division of opinion on the question of extending American political influence into the Far East, and since the decision was made to withdraw from the Philippines, the opponents of political expansion appear to have the upper hand.

If the problems of immigration and commercial rivalry had not acquired a political implication, the more serious aspects of this friction would have been avoided. Unfortunately, however, Americans began to believe that these issues harbored the possibility of armed conflict. Such a belief was naturally capitalized by nationalists in both countries, especially the Big Navy groups, and was largely responsible for the so-called Japanese-American "war scares." As a result, Japan's former alliance with Great Britain acquired a sinister significance in the American mind because of the likelihood of serious complication with England in the event of a war with Japan. But this treaty also exercised another influence on American public opinion which has been completely overlooked by writers on this subject.

During the history of the alliance relations between Germany and England were most hostile, and at the same time the Irish question was a bitter issue in British politics. These purely European complications were directly transmitted to the United States because of the large German and Irish elements in the American population which were naturally anti-British. For the most part, however, official Anglo-American relations during this period were quite friendly, and the old American game of twisting the lion's tail was no longer sufficiently popular to give the Irish and Germans a suitable tool to arouse American prejudice against England. But the existence of the Anglo-Japanese alliance offered a new and attractive instrument, which the German and Irish groups naturally used in connection with Japanese-American difficulties. It is certainly not a mere coincidence that such a large number of the anti-Japanese agitators in the United States during this period bore German and Irish names. German and Irish newspapers and periodicals published in the United States were consistently anti-Japanese and anti-British, and frequently played off friction with Japan against England by showing that the United States might have to face two enemies because of the Anglo-Japanese alliance. This is brought out most clearly at the time of Japan's entrance into the World War, when German and Irish publications took the lead in attaching ulterior motives to Japan's action and German-American Clubs and Societies made every effort to stir American opinion against England by demonstrating that the Oriental ally of this Power was bent on creating trouble for the United States in the Pacific. As one German-American organization declared in a public announcement: "This is the same England that during the struggle of the American Colonies for independence aroused the Indians and armed them against American patriots."

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* From *Contemporary Japan*

Before America's entrance into the war in 1917 official German propaganda likewise tried to make the most of anti-Japanese sentiment in the United States for the same purpose. It would be difficult, of course, to measure the extent to which these efforts actually influenced American opinion toward Japan, but the decade of friction between the two countries unquestionably created a fertile field for such activity, while the existence of the Anglo-Japanese alliance brought the issue into the complications of European diplomacy.

Washington Conference

The results of the Washington Conference liquidated many of the causes of Japanese-American tension and created the most friendly atmosphere since 1905. The unfortunate revival of agitation against Japanese immigration, culminating in the Exclusion Act, destroyed much of this friendship, but it likewise brought about a more widespread sympathy for Japan because the idea of racial discrimination cut against the sense of justice in many Americans who otherwise had no particular friendship for Japan. There is no doubt that the subsequent movement to put Japanese immigration on a quota basis was making rapid progress and had the exponents of discriminatory exclusion on the point of being routed when the Manchurian incident broke out in 1931. The conflicts between Japan and China since then have once more stirred American opinion against Japan, forcing the quota movement into the background.

It is possible that this incident will again mark another definite turning point in Japanese-American relations. Affairs in the Far East since 1931 have tended to make anti-Japanese sentiment in the United States lose most of its former regional and occupational lines and acquire an almost universal scope. This is due largely to a sympathy which has been built up for China, the underdog in American estimation, a fear that these Far Eastern outbursts will start another world war, and an acceptance by most Americans of the verdict that Japan has violated treaties and been the aggressor nation.

Yet the actual Manchurian affair was not wholly responsible for this reaction. By 1931 many Americans had become convinced that Manchuria was of vital necessity to Japan, and were willing to accept Japanese arguments that armed force was necessary to protect the nation's continental "life-line." But American opinion was not prepared, either in 1932 or in 1937, to accept the reasons advanced for the extension of hostilities to other parts of China. The two Japanese attacks on Shanghai have been of major importance in stimulating American hostility toward Japan in recent years.

Any study of American opinion toward Japan reveals three significant points which are of particular importance at the present time. For the most part American policy toward the Far East has quite accurately represented the expressions of American public opinion. But even in the most bitter complications between Japan and the United States, except for the outbursts of a few professional war-hawks like Captain Hobson and Congressman Britten, the great majority of American opinion has clearly demonstrated that it does not want war with Japan if a conflict can possibly be avoided. Even at the height of the Shanghai fighting in 1932 and in 1937, when American temper and indignation were high, public opinion has deplored the idea of war. Finally, it should be noted that the American public has never favored any program for joint action with other Powers against Japan.

Reaction to *Panay* Sinking

The present American reaction to an incident as grave as the sinking of the gunboat *Panay* should go far toward proving these basic conclusions. Although the sinking of the *Maine* and the *Lusitania* were largely responsible for America's entrance into two previous wars, the *Panay* affair has provoked no such demand, and the fact that it coincided with the firing on certain British vessels has offered no opportunity for enlisting American support in a joint demonstration against Japan. At the most the American Government has demanded an apology for the accident, assurances for future safety, and adequate indemnification, largely because the American people expect and want no more. In a country where foreign policy has been consistently a reflection of public sentiment, it is not necessary to present a bellicose ultimatum to uphold national "prestige" and assure popular support on the home front. One might well reflect on how far other nations have gone in the past in incidents far less grave than the *Panay* affair. Even though the present conflict in China had stirred anti-Japanese feeling in the United States to a new high water mark, a friendly settlement of such a serious incident has not been jeopardized. This should show that there are still certain advantages to be had in dealing with a democracy where even foreign policy is the mandate of the people.

China Needs World Help

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to import luxuries, machinery and other commodities from foreign countries.

At this point I should like to digress long enough to mention a visit to Hongkong in 1935, when the Jubilee of the reign of King George V and Queen Mary was being celebrated. Now, no Chinese, regardless of his wealth, may live in a house in the hill district of that island. This is a glaring example of British discrimination against the Chinese. Yet the Chinese residents staged a large scale Jubilee celebration and, even under constant British discrimination and exploitation, they were glad to honor in this way the country that was bleeding them. Such is the cleverness and effectiveness of British colonial policy. I wonder if the Japanese colonial administration is as competent and successful, and whether the Japanese could not learn something about the subject from this incident.

In any event, the interests of world economy demand that the China Incident should be successfully terminated as quickly as possible, and that thereafter the United States, Great Britain and other countries should join hands with Japan in developing China's natural resources through investment and other means. No people have been subjected to greater exploitation and pressure than the Chinese. The world must recognize this and must also recognize that the common interests of the nations demand efforts to improve the national livelihood of the Chinese. The sooner this is done the better.

Japan's Friendship for America

(*Continued from page 330*)

Goodwill Desired

The genuine desire to preserve American goodwill has been predominant throughout the present crisis, and the Japanese Government, in close co-operation with the Japanese press, has kept working in this direction. *Domei*, the Japanese news agency, has only recently increased its staff in New York, and favorable reports about America continue to pour in. The personal touch is not lacking on this side of the Pacific Ocean, either. The American Ambassador in Tokyo, Joseph Clark Grew, is the most popular among the representatives of foreign countries in Japan.

So one does not believe all he hears here in Tokyo, nor even all he sees. The German community is increasing. The Italian gunboats land at Yokohama for goodwill visits. In the lobby of Tokyo's Imperial Hotel, where the foreign community clusters together, one hears the constant clicking of German heels, and big black cars flying the swastika on triangular red pennants come roaring into the front yard all day long. Sleek Japanese liaison officers busy themselves around the uniformed newcomers, reiterating their "Ach so"—which sounds like the Japanese equivalent, "asodes'ka"—"Is that so?"

One sees and hears these things; and then one goes among the people and understands that Tokyo's official front is just that—an official front. The underlying sentiment toward the United States remains one of strong friendship.

North China Development Problems*

By SHINTARO RYU

On July 7, 1938, the first anniversary of the outbreak of the China Affair, the *Tokyo Asahi* published an article by its correspondent at Peking, who wrote :

" What Japan seeks in the new China (North China) is neither territory nor domination. Japan is striving for economic co-operation, purely and simply, in the development of natural resources. In this respect, the situation is quite different from that in Manchoukuo where the problem of defense is of prime importance."

This is a clear statement of the case and should be sufficient to allay misgivings harbored concerning Japan's activities in North China. Now that this country has been fighting these twelve months, sacrificing the youthful blood of no less than thirty thousand men, this claim must be said to be wholly reasonable. That Japan has no territorial ambitions in North China is supported by the appearance there of a new political system under the leadership of Mr. Wang Keh-min. That Japan genuinely seeks to better living conditions in North China is shown in its manner of procedure in the development of the Lung-yen iron mine in Chahar and the Tatung colliery in Shansi.

At the Lung-yen mine, the miners' wages, which had averaged less than 30 sen a day heretofore, have since been raised to 45 sen, an increase of 50 per cent. Similarly in the Tatung mine, the average wage has been increased from 40 sen to 56 sen, demonstrating a sympathetic endeavor on the part of Japan to raise the standard of living of the Chinese population in the district.

The correspondent spoke of economic co-operation. For the sake of economic development each new company is to take the form of a partnership between the two countries. Capital is needed in an agricultural country like North China and her contribution must necessarily be in the form of property, while the capital required will have to be raised by Japan. In this way alone can the latent wealth of North China be made available for economic purposes.

Japan has a special reason to be eager for economic development in North China. She is dependent upon imports of raw materials for her manufacturing industries. North China can supply her economic wants : cotton for her textile industry ; iron and coal for her heavy industries. Had it not been for the hopeless spread of anti-Japanese agitation in China, Japan long ago would have achieved effective co-operation in the economic development of North China, to the infinite benefit of both countries. In fact, prior to the outbreak of the present trouble, a plan to this end was well under way. Just before the hostilities, negotiations with General Sung Cheh-yuan for the purchase of the iron mine at Lung-yen, which had been remained unoperated for some twenty years, were being conducted with every prospect of successful conclusion. But warfare necessarily halts all peaceful progress. To-day, with the establishment of the Provisional Government of the Republic of China, the Sino-Japanese Economic Council has been formed, whose duty is to investigate and discuss all matters relating to the economic development of the land by peaceful means.

Farm Products Important

Primarily the economic importance of North China lies in its agricultural products ; its wealth in mineral products is potential rather than actual. In fact, the goods exported from the principal ports of Tientsin and Tsingtao at present are almost exclusively agricultural. The staple farm products of North China are millet, comprising 63 per cent of the total Chinese supply, wheat, comprising 30 per cent of the total crop, followed by kaoliang, maize, barley and peanuts. The greater portions of these are for immediate domestic consumption and, as in the case of wheat, are often insufficient for the requirements of the local inhabitants, necessitating further supplies from Central China. Cotton, tobacco and wool are among the important commodities finding their way into world markets ; some three million piculs of cotton annually are available to the trade.

The principal exports from Tientsin in 1936 were, in order of importance : raw cotton valued at twenty-three million yuan, wool, fur, eggs and their manufactures ; and pig-bristles. From Tsingtao, exports in 1935 were led by peanut oil valued at ten million yuan, followed by leaf tobacco, meat and salt. Manufactured goods were represented by cotton yarn alone, valued at two million yuan. Similarly, in the manufacturing industries cotton spinning alone achieves importance. According to the statistics for 1934 there were some 470,000 spindles owned by eighteen mills, representing one-sixth of the total number of spindles installed in all of China.

Next to the textile industry come the flour and, more recently, the match, woolen fabric, rubber and chemical industries. Their manufactured goods, however, are mainly for domestic consumption. Production of minerals, manufacture of machines and tools and electric enterprises occupy an insignificant place in the industrial activities of North China. In Tientsin, the capital employed in these heavy industries amounts to but ten per cent of the total capital invested in this area, and the number of factory workers engaged in the same industry hardly exceeds eight per cent of the total.

Imports at Tientsin, on the other hand, comprise iron and steel valued annually at 101 million yuan, petroleum, machines and tools, chemical products, timber, paper, dye-stuffs and paints, bicycles and parts. At Tsingtao, weaving machines and parts take the lead in imports, followed by petroleum, timber, raw cotton and cotton textiles. Here we have the paradoxical fact that in North China, where minerals are said to abound, iron, steel and machinery constitute the principal items of imports at Tientsin and Tsingtao. This fact is valuable in demonstrating the actual state of industries in North China and the real significance of its natural resources.

Latent Wealth of China

Nevertheless, the latent wealth in resources is reported to be abundant. One estimate places the amount of unmined coal in North China at 130,000 million tons, which is more than 50 per cent of the total for all China, and the amount of iron at something over 170 million tons. In the Lung-yen iron mine, now under Japanese management, an estimated total tonnage of 100 million tons is said to be rather conservative. The Tatung coal fields in Shansi, extending over an area of 17 by 120 kilometers, are believed to contain over 10,000 million tons—an inexhaustible supply for all practical purposes. The main sources of coal production in North China at present are the Kailan mine in Hopei, which is being operated by British interests and produces five million tons annually, the Tsingsing mine, under joint German and Chinese capitalization, capable of producing 500,000 tons annually, the Tzuchuan colliery in Shantung, producing 540,000 tons and the Tatung colliery in Shansi producing 900,000 tons. Thus, the total available supply amounts to twelve million tons annually, which can be produced with the return of peace and order without involving any great outlay of fresh capital.

The estimated yield of iron for North China represents 46 per cent of the total for all of China, but the actual figure is not imposing. Lead is produced in lesser amounts, while the Shantung salt amounts to 25 per cent of China's total production. The three million piculs of raw cotton produced annually do not leave much available for exports—hence the drive to increase the production to ten million piculs. To repeat, the raw materials in North China remain as but potential value to heavy industries.

North China has a population nearly as large as that of Japan while its territory is twice as large and comprises a vast expanse of plains. The country is primarily agricultural ; the backward state of its capitalistic development with a scanty accumulation of native capital has hindered the rise of industry. Consequently, the productive capacity is so limited that farm products are used solely for internal consumption, save for a few articles like wool, fur and pig-bristles, which are available for the export trade.

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* From *Contemporary Japan*.

But the possibilities are there. It may be gathered from the above that the vast stretch of land which is North China has two characteristics, viz., large, potential mineral resources such as coal and iron and a large population offering cheap labor in abundance. The latter suggests a strong purchasing power once the land is fully developed. Both characteristics offer a temptation to Japanese capital—a temptation, because the other conditions in North China are not necessarily favorable to the exploitation of resources.

In the first place, the want of native capital is a great drawback. The fact that capital goods, which are indispensable for developmental work, cannot be produced in North China is another discouraging factor. Nor can the banks in North China be expected to be provided with adequate foreign balances making possible the importation of capital goods. The tyranny and extortion of war-lords from the old have rendered impossible any savings or accumulation of capital in the shape of currency. The suggestion may be made to build up holdings of foreign balances by increasing exports, but when it is recalled that the trade position of North China previous to the outbreak of the present Affair represented an excess of payments over receipts to the extent of 100 million yen, it can be seen that the export trade cannot easily be built up with the articles of export limited to farm products. This is especially true since, for some time to come, transportation of goods from the interior will encounter considerable difficulties. Additionally, it will be long before the present plans for increasing productive capacity will begin to make their influence felt. Under the present circumstances, Japanese capital remains absolutely essential to the development of North China.

Japanese Investments

Investments of Japanese capital in North China will be administered by the North China Development Company, which is to be established in October with a capital of 350 million yen, of which one-half is to be contributed by the Government and the remainder by private interests. The Company is authorized to issue debentures up to five times the amount of its authorized capital. As an investment company, its aim will be to invite further investments from the public at large. Affiliated companies will be created in various branches of industry such as the iron, coal, railway, harbor improvement, communications, salt, and electric industries. These subsidiary companies will, in addition to the contributions from the parent establishment, issue their own shares and debentures and will also resort to borrowing.

The capital plan provides 447 million yen for transportation enterprises, 738 million yen for mining, 144 million yen for electricity, 36 million yen for salt and 34 million yen for communications, an aggregate amount of 1,420 million yen. The entire enterprise will be undertaken through co-operation between Japan and China, although investments by third parties will be welcomed. For the North China Development Company, the first instalment of governmental capital will be for a quarter part; of the capital to be raised through private subscription, half will be taken by the Mitsui, Mitsubishi and Sumitomo interests and by the life insurance companies.

The following table from the *Asahi* of June 29, 1938, gives the capital plan for the North China Development company:

(*In thousands of yen*)

	1938-39	*1939-40*	*1940-41*	*1941-42*	*1942-43*
(1) Shares:					
Gov't ownership ..	55,569	11,940	—	—	—
In cash	24,983	11,940	—	—	—
In property	30,586	—	—	—	—
Private ownership ..	43,750	43,750	—	—	—
Total	99,319	163,180	—	—	—
(2) Debentures	—	116,260	181,720	198,540	120,500
(3) Grand total	99,310	279,440	181,720	198,540	120,500

The seven industries mentioned above are placed under the control of the Development Company. Other industries such as cotton spinning and flour manufacturing are left to the investment of outside capital. But the control to be exercised by the Development Company is chiefly one of capital. In other words, the Company holds a monopoly of capital on which the Japanese Government guarantees a minimum dividend of six per cent. Unlike Manchuria where industries are largely under State control, one sees in existence in North China a relatively pure capitalistic structure. Here, foreign capital other than Japanese will find a more ready welcome.

Dividend awards for the first five years by the North China Development Company, according to the plan of the Organization Committee, are as follows:

STATEMENT OF ACCOUNTS IN ESTIMATES

(*In thousands of yen*)

	1938-39	*1939-40*	*1940-41*	*1941-42*	*1942-43*
Receipts	732	10,606	23,651	35,812	48,830
Payments	1,674	5,373	17,620	22,309	30,110
Net profit	(–) 942	5,233	6,031	13,503	18,720
Rate of Dividend:					
Gov't shares	—	—	—	3.0	6.0
Private shares	—	5.5	6.0	6.0	7.2

"Receipts" include Government subsidies, and "Payments" include the same repaid.

The question may be raised as to how the creation of the Development Company will serve to hasten the economic development of North China. One must be prepared for great difficulties.

Yen Bloc Aids

Japanese capital has been made available more easily because of the establishment of the Federated Bank of China, which has completed the linking of the currency of North China with the Japanese yen. The birth of a yen bloc uniting Japan, Manchoukuo and North China has thus facilitated investments of capital in terms of yen in the last-named country. With progress in developmental works, however, the import of capital goods will come to assume such importance that it may prove to be a drain on North China's foreign balances. In that eventuality, the situation is bound to weigh heavily upon Japan's position in international payments. Here is a serious problem bearing on the scale and rate of progress of industrial enterprises in North China.

In the period prior to the outbreak of the China Affair, the foreign balances of North China were in a somewhat stronger position than those of Central China; if imports of capital goods continue on a moderate scale, nothing untoward will occur to impair her credit standing. To-day, Japan, is hard pressed to carry on a vigorous plan for the expansion of heavy industries, particularly with the five-year industrial plan in Manchoukuo calling for an outlay of over 5,000 million yen, and with the Central China Development Company in Shanghai (a more modest affair) demanding an outlay in currency of some 200 million yen within three years. The major portion of this currency investment will go for the importation of productive goods.

Putting aside Japan's position in international payments, the immediate problem is whether or not North China, or the Federated Bank of China, which is the same thing for our purpose, is provided with adequate capital resources in the shape of foreign exchange, gold or silver wherewith to finance the necessary imports. The situation seems not altogether reassuring. At any rate, when the old Chinese currency tends to depreciate owing to lack of confidence in it, it devolves upon the Federated Bank of China to see that the value of the new currency is placed on a firm and stable basis and that the people are inspired with confidence and hope in their daily life. With the gradual restoration of peace and order in the land and with the expansion of the export trade, the Bank will also do well to turn its attention to the exchange business.

Silver Hoard

It is probable that at least a quarter part of the capital of the Federated Bank is held in receipts from Chinese banks—an amount of twelve million yen in silver. Beside, by March 10, 1939, when the remainder of the old national currency will be retired, the Federated Bank will come into possession of all the silver held by the Committee entrusted with the custody of the silver stock. While the amount of this silver is not known accurately, silver

(*Continued on page 336*)

Japan's Colonial Development*

OFFICIALLY, Japan has no colonies. The areas that usually come under that category are theoretically being absorbed into the prefectural system with the greatest possible speed. Actually, however, there are five colonies of varying status, ranging from Formosa and Korea, which formerly were claimed by China, to the islands of the Western Pacific, held by Japan under a mandate from the League of Nations. The two others, Karafuto and the Kwantung Leased Territory, were obtained from Russia in 1905 under the Portsmouth Treaty. All five come under the jurisdiction of the Overseas (or Colonial) Ministry.

Development plans have been devised by the Government for the exploitation of all of these areas. The rôle assigned to each is different. Korea obviously is considered a protective outpost extending the frontier onto the continent of Asia. Heavy industries are being developed there to supplement the existing facilities in Japan Proper, as well as to assure at least a partial supply of munitions to troops on the mainland in the event seaborne traffic is interrupted. Recently, particular attention has been devoted to the North Korea triangle, the strategic area where Japan, Manchoukuo and the Soviet Union meet in a tangle of mountains, rivers, plains and seacoast.

Saghalien Has Trouble

Formosa (Taiwan, to the Japanese) plays the part of the Empire's sugar bowl. It is being intensively developed as an agricultural reservoir for Japan Proper. Its fertile soil and industrious population, now utilized to the fullest by big Japanese industrial interests, are steadily developing the island into a more important source of foodstuffs. Currently, emphasis is being placed on the production of industrial raw materials, such as alcohol and salt. Rice and sugar remain as the most important products, however.

Lying far to the north of Japan Proper, Karafuto (the southern half of the island of Saghalien) offers something of a problem. Its relatively severe climate offers little attraction for settlers, while the perennial troubles with the Soviet Union make uncertain the exploitation of its natural resources. At the same time, the island affords an excellent base for Japanese interests operating in the north and cannot for that reason be totally ignored. Japan's many difficulties in other directions, however, have allowed little time or money to be spent on this territory.

COLONIAL TRADE STATISTICS

(In Y.1,000)

KOREA

	Shipments to Japan	*Shipments from Japan*	*Foreign Exports*	*Foreign Imports*
1910	15,378	25,348	4,535	14,434
1914	306,660	211,817	22,379	97,776
1934	407,693	439,622	57,673	79,527
1935	485,893	558,813	64,902	100,589
1936	518,047	647,918	75,265	114,499

FORMOSA

	Exports	*Imports*	*Total trade*
1897	14,857	16,383	31,240
1913	62,697	62,628	125,324
1926	251,425	183,412	434,838
1934	305,929	215,022	520,950
1935	350,745	263,120	613,864
1936	387,949	292,686	680,635

SAGHALIEN

	Exports to Japan Proper	*Imports from Japan Proper*	*Total trade*
1934	96,648	37,129	133,777
1935	92,884	38,055	130,940
1936	119,435	53,771	173,207

MANDATED ISLANDS

	Exports	*Imports*	*Total*
1934	18,424	12,970	31,394
1935	26,374	15,221	41,595
1936	25,259	19,080	44,340

COLONIAL INDUSTRIAL ENTERPRISES

(All in Y.1,000)

SAGHALIEN PULP AND PAPER PRODUCTION

	Paper	*Pulp*	*Total*
1934	28,247	37,229	61,477
1935	32,464	38,905	71,370
1936	44,248	37,267	81,515

KOREAN MINERAL PRODUCTS

	1936	*1935*	*1934*	*1910*
Gold	49,909	38,320	33,214	3,744
Placer-gold	9,443	7,136	5,323	821
Gold and silver ores ..	9,373	6,502	2,511	509
Pig iron	7,866	7,331	7,722	—
Coal	13,300	11,925	9,940	388
Total including others	110,503	88,039	69,172	6,067

KOREAN MARINE PRODUCTS

1911	6,760
1934	57,777
1935	65,966
1936	79,879

FORMOSAN MARINE PRODUCTS

1910	915
1936	14,934

FORMOSAN TEA PRODUCTION FOR 1936

Oolong	3,571
Pouchong	3,394
Black tea	4,517
Green tea	2
Total	11,486

At the other extreme are the Mandated Islands, consisting of the Marshall, Caroline and Mariana Islands lying north of the equator. Of vital strategic value in any naval engagement, this territory may not be fortified, according to the terms of the League of Nations Mandate that assigned these islands to Japan after they had been taken away from Germany. Aside from their possible wartime value, they are annually absorbing more Japanese settlers, who find life on a tropical island to their liking.

Japan's westernmost outpost of a formal nature is the Kwantung Leased Territory, an area of about 538 square miles with Dairen as its chief port. Situated at the tip of the Liaotung Peninsula, the southern extremity of Manchuria, it was originally a valuable base for the commercial penetration of North China and Manchuria. As a result of the political changes in that area since 1931, Kwantung has lost most of its importance and is now completely subordinate to the Kwantung Army, the Japanese force that garrisons Manchoukuo. It remains as an important center of communications between Japan Proper and the Asiatic continent, however.

Government Investments

Plans for the exploitation of most of Japan's colonies are directed by officially organized "development companies." In general, these firms include at least a 50 per cent Government investment, the rest of the capital coming from private enterprises interested in the territory involved.

The Oriental Development Company is taking the lead in the current trend toward the utilization of the hydro-electric resources of North Korea, a move that, incidentally, is attracting considerable attention among Japanese industrialists. The Funei Hydro-Electric Company was recently established with a capitalization of Y.10,000,000 and with a generating capacity of 25,000 kilowatts. The Yalu Hydro-Electric Company (Y.50,000,000 capital) will develop 200,000 kilowatts and the Kogen Hydro-Electric Company (Y50,000,000) will turn out 300,000 kilowatts. All three firms will operate in North Korea.

The Oriental Development Company has supplied more than half of the capital in each case. As the result of a revision of its organization law by the Diet at its last session, the parent firm is now able to issue debentures up to 15 times its paid-up capitalization. The former limit was ten times. Ordinary businesses are limited to twice their capital.

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* From the *Japan Advertiser*.

Noguchi Is Active

The utilization of water power in North Korea is now the most important Japanese undertaking on the peninsula, both in scope and the amount of money invested. The extensive tableland along the northern and western frontier, particularly at the headwaters of the Yalu River, is the scene of most of this development. The stream has been checked at several points with dams, so that water is conserved for year-round use. Three such reservoirs have already been completed on the Fusen River, a tributary of the Yalu, by the Chosen Nitrogen Fertilizer Company, a subsidiary of Japan Nitrogen Fertilizer Company of Osaka.

The uppermost of these three reservoirs has an altitude of 5,000 feet. As a result of the sharp fall of the river, a total of 180,000 kilowatts can be generated at the three installations. The same company plans to generate an additional 400,000 kilowatts on the Kyosen River, another tributary of the Yalu.

POPULATION OF JAPAN'S COLONIES

(March 31, 1937)

	Families	Population
KOREA		
Japanese ..	152,887	608,964
Koreans ..	4,011,899	21,373,572
Formosans ..	4	25
Foreigners ..	14,139	65,275
Total ..	4,178,929	22,047,836
FORMOSA		
Japanese ..	81,027	282,012
Formosans ..	848,216	5,108,914
Aborigines ..	25,194	152,350
Koreans ..	315	1,694
Chinese citizens	15,452	59,015
Foreigners ..	105	228
Total ..	945,115	5,451,863
SAGHALIEN		
Japanese ..	60,748	312,926
Koreans ..	1,446	6,604
Natives ..	415	1,876
Foreigners ..	110	359
Total ..	62,719	321,765
SOUTH SEA ISLANDS		
Japanese ..	14,821	56,496
Islanders ..	9,514	50,524
Foreigners ..	53	117
Total ..	24,388	107,137

Formosa Firm Expands

Surveys indicate that a total of 1,500,000 kilowatts can be developed in the entire Yalu River system. This power is to be used for the chemical industry when the project is completed. However, full exploitation of these resources will require about Y.300,000,000. The company plans to supply power to other important enterprises in Korea and Manchuria now dependent on steam.

New enterprises in Formosa are now handled to a great extent by the Formosa Development Company, which was organized by the Government in 1936. The firm is also active in the Mandated Islands, French Indo-China and other parts of the South Seas. Half of the Y.30,000,000 capital was invested by the Government of Japan in the form of property and rights.

A four-year plan for the production of salt in Formosa is the most recent project. The program calls for the production of 450,000 tons a year by 1942. For this purpose a Formosan Industrial Salt Company will be established by the development firm in co-operation with the Formosan Salt Industry Company and the Dai Dippon Salt Industry Company. Each organization will invest Y.10,000,000.

Formosa Development recently purchased a mining concession in French Indo-China, where three deposits were previously worked on a lease arrangement. They have a daily output of about 500 metric tons of iron ore, with total estimated reserves of approximately 20,000,000 tons. The company is at present surveying the mines and expects to be working them before the end of this year.

A project for undertaking the operation of an iron mine near Johore, close to Singapore, is now being contemplated. If Formosa Development is able to charter enough ships, it hopes to bring 200,000 tons of iron ore to Japan this year from Johore. The 1939 quota has been set at 500,000 tons.

A new source of revenue for Formosa is to be alcohol, which now must be mixed with gasoline for fuel in Japan. Until a dependable supply can be built up in Japan Proper, almost all of this alcohol will have to be brought in from Formosa. The production cost is high, however, and the future of this industry is by no means certain.

Soviet Pressure Felt

Two semi-official firms operating in Karafuto are in miserable condition as the result of growing Soviet pressure against Japanese enterprises. These are the North Saghalien Oil Company and the North Saghalien Mining Company, which have their bases in Japanese territory, but are operating in the northern half of the island, under Soviet jurisdiction. Both have had to reduce their output drastically as a result of their inability to obtain enough employes.

Because of Japan's greater interest in other more pressing problems, the two firms have little chance of getting Government assistance in their present plight and there is less likelihood that they can be revived by their own efforts.

All of Japan's colonies have been suffering to some extent from the close restriction on the use of funds that has accompanied the fighting in China. Businesses of a nature that make them useful in the manufacture of munitions have had a preferred position, however, and it is worthy of notice that the main advances in Korea and Formosa during 1937 were in these fields.

North China Development Problems

(*Continued from page 334*)

held in Peking and Tientsin before the outbreak of hostilities is believed to have totalled some 50 million yuan. It is probable, therefore, that the Federated Bank of China will acquire a tolerably large amount of silver. Of course, the Bank will have to use the silver so acquired as reserve for its note issue, but the portion in excess of the legal reserve requirements may well be employed for acquiring foreign currency and exchange. In view of the fact that, in the past, no mean portion of the excess of payments over receipts in the international account is reported to have been met by smuggled silver, this mysterious country of China may yet be in possession of an unknown, hoarded quantity of the white metal. Be that as it may, the problem of building up foreign balances must, in the normal course of things, find its solution in the expansion of the export trade. The healthy development of North China can be achieved through the growth of her export trade as much as through the exploitation of natural resources for heavy industries. Positive measures, furthermore, must be applied to utilize as far as possible the capital available at home and to invite foreign investments.

In the allocation of the profits of the North China Development Company, the law creating this company provides for a governmental guarantee of a six per cent dividend on the shares owned by private interests. According to the profit and loss accounts estimated by the Organization Committee, previously listed, dividends will be maintained at over six per cent, with the exception of the year 1939-40, when 5.5 per cent will be awarded. To conservative ears, this sounds altogether too good.

The North China Development Company is said to be contemplating something like a five-year plan, with the expansion of the productive industries as the supreme object of that plant. Needless to say, due consideration should be given to the matter of elasticity in business management in order that the Company may cope efficiently with any changes in the trade outlook. The Federated Bank will do well to guard against the danger of inflationary processes that may arise in the course of the operations of the Company. It is gratifying indeed that the management of the Bank is standing pat on the principle of sound and stable money, which will enable it to steer clear of treacherous shoals.

Japan's Gold Production Policy

The following is a statement issued by the Japanese Department of Commerce and Industry).

* * *

In the present emergency, the production of gold in Japan is important. Among the many far-sighted ways of coping with the exigencies of the current situation, increasing the domestic production of gold is of particular value in aiding national defence, strengthening industry, improving the international balance of trade and in stabilizing the economic life of the people.

Economic, industrial and various other phases of the Japanese national life that had been on a semi-wartime basis for several years have swiftly been placed within an actual wartime structure since the outbreak of the China Affair. All the forces of the nation have been mobilized. The new circumstances which have arisen with the hostilities, those that may yet develop, and the perpetually changing international situation complicated by the interests of foreign powers in East Asia make it inconceivable that the things now placed on a wartime basis in Japan can be altered suddenly even when the China Affair has been brought to an end. On the contrary, it is necessary to enlarge the scope of the present wartime structure. Japan must concentrate her entire energy in the task of augmenting productive capacity in order to replenish the materials required for national defence and to maintain a high standard of quality and efficiency—in other words the task of establishing and operating a defence-centred economy.

To accomplish this task a large supply of goods is required. Lacking natural resources, Japan to-day depends on importation from foreign countries for a large number of materials for armaments, munitions and various capital goods. Semi-finished goods are particularly needed in connection with defence-centred economy.

However, the greater the importation of goods, the worse will become the already adverse international balance of trade. Hence, it is necessary to adopt feasible measures to maintain equilibrium in international accounts while attempting to import adequate amounts of goods needed. Promotion of the export trade constitutes one of these measures. Through concerted efforts on the part of the Government and the people, Japan's export business has continued to advance in the face of high tariffs, import quota systems and various other restrictive measures adopted by other countries. Simultaneously, the Government has introduced the Foreign Exchange Control Law, the Law Concerning Adjustment of Foreign Trade and Allied Industries and the Law Concerning Temporary Measures on Exports and Imports. Through these measures it has been attempted to adjust foreign trade by prohibiting or restricting imports of goods which have been considered unnecessary or non-urgent.

The remaining method of bettering the international balance and maintaining foreign exchange position of the yen on a sound basis is to replenish funds for settlement of foreign exchange. The most effective measure here is to increase the production of gold within Japan.

Even in time of peace gold is necessary as a means of purchasing goods from abroad and as the basis for the currency system of the nation. It has particular significance in Japan to-day, for whether or not we can acquire an adequate amount of gold constitutes a key to determine whether we shall be able to cope with the present emergency. Accordingly, the Government has made substantial appropriations for various gold production measures, notwithstanding the large expenditures required for other undertakings.

The Gold Production Law

Since 1932, the Government has enforced many policies concerning gold: the purchasing of gold at current market prices; the reduction of railway freight rates on gold ore; the reduction of fees for analysing gold ore at the Bureau for Supervising Mines; the subsidization of construction of gold refineries, and the guiding of operations of gold mines on minor scales. As a result, the production of gold has increased considerably. In Japan Proper alone, in 1936, it amounted to more than 22 metric tons valued at Y.74,820,000 whereas in 1931 only a little over 12 metric tons of gold valued at Y.16,500,000 were produced. Production in the Japanese Empire, including Taiwan and Chosen, which was about 22 metric tons, valued at Y.26,840,000 in 1931, increased sharply to more than 41 metric tons worth Y.138,560,000 in 1936.

However, even this latter amount is inadequate at the present time. The Government therefore promulgated the Gold Production Law (Law No. 59 of 1937) which went into effect on August 28 of that year, with a view to increasing production of gold in an aggressive manner and to concentrating the precious metal in governmental hands so that it may be utilized in equibalancing international accounts. In conjunction with the execution of this law, the Government is encouraging gold production with a sum of approximately Y.22,580,000 to be spread over five years from the 1937 fiscal year.

For the promotion of the gold mining industry, the Government also introduced the Law Concerning the Japan Gold Production Promotion Company, Limited, at the 73rd session of the Imperial Diet. Approved by the Diet, the law was promulgated on March 29, 1938, and is expected to be enforced shortly. The company to be organized under this law will be a special semi-governmental corporation whose functions will be to facilitate supply of abundant funds for gold mining enterprises and also to undertake various promotional enterprises in connection with the industry, such as the refining of poor ores.

On May 2, 1938, the Government raised its buying price of gold from the former level of Y.3.77 per fine gram to Y.3.85, the current level of the world gold market. On May 9, it abolished the gold buying commission which had hitherto been levied, and reduced by 50 per cent the rates of refining fees charged by the Mint on gold bullion to be sold to the Government, the rates of fees on certificates of the quality of gold bullion and those of fees on testing. At the same time, the buying commission on gold bullion in small lots below 50 grams was abolished.

Essential Points of the Gold Production Law

The essential points of the Gold Production Law may be listed as follows:

(1). Persons desiring to engage in the business of gold refining and of buying minerals containing gold are required to secure licences from the Government.

(2). Persons who have acquired minerals containing gold or alluvial gold or any substance containing gold are required to refine them into gold bullion and to sell the latter to the Government, or to sell them to licensed gold refiners or buyers of minerals containing gold. When these buyers have refined the bullion, they are obliged to sell it to the Government. Thus, all newly refined gold is to be concentrated by the Government, irrespective of the channels through which it may be obtained.

(3). Gold refiners are required to formulate their plans of operation in advance and to report them to the Government. Reports are also required concerning changes in plans. The Government is authorized to order alterations in the plans of the refiners.

(4). Whenever it is deemed necessary for the augmentation of gold production, the Government may, on the recommendation of the Gold Commission, command gold refiners to expand or improve refining facilities and may give necessary instructions concerning such facilities.

(5). Owners of mining rights and rights on alluvial minerals containing gold shall be treated in the same manner as gold refiners, with respect to business operations.

(6). When it is deemed necessary for the public welfare, the Government may, on the recommendation of the Gold Commission, issue orders to persons who are engaged in gold mining, gold refining and buying of minerals containing gold.

(7). The Government is authorized to demand reports from gold miners, gold refiners and persons engaged in the business of buying minerals containing gold concerning their business methods and assets, and may also investigate such matters. The Government may further issue supervisory orders regarding the accounting methods of the above persons or may take necessary action.

(8). When it is deemed necessary, the Government may, on the recommendation of the Gold Commission, issue orders regarding the price of gold, restrictions on the use of gold and other matters relating to the consumption of gold. This provision has been put into force through Ordinance No. 60 Concerning Regulations on Gold Consumption of the Department of Finance, promulgated on December 28, 1937.

(9). Machinery, tools or other materials necessary in the business of gold miners or gold refiners, when imported with the approval of the Government, shall be exempted from import duties for a period of five years from the day on which the Gold Production Law went into effect.

(10). The Government may give subsidies to gold miners or gold refiners within the limits of the amount fixed in the budget.

Encouragement of Gold Production

Measures for encouraging the production of gold are roughly as follows:

(1). To give subsidies to those prospecting for gold mines.

(2). Subsidization of construction of facilities for selecting and refining ore.

These measures are to be carried out in accordance with the provisions of the Gold Production Law. Procedures relating to these measures are provided for in Ordinance No. 22 Concerning Gold Production Encouragement Regulations of the Department of Commerce and Industry, promulgated on October 10, 1937. Other measures are:

(1). To subsidize expenses covering institutions for training the field staffs of gold mining companies.

(2). To survey mineral deposits in gold producing areas.

(3). To hasten the disposal of applications for gold mining licences.

(4). To lend machinery and tools for gold mining.

Japan Gold Production Promotion Co., Ltd.

A summary of the prospectus of the Japan Gold Production Promotion Company, Limited, is as follows:

(1). Organization of the company: This company is to be a special joint stock company organized under a special law.

(2). Purpose of the company: To conduct operations necessary for the promotion of gold mining and refining.

(3). Capital: Y.50,000,000 of which Y.25,000,000 is to be invested by the Government. The capital may be increased on the approval of the Government.

(4). Officers: (*a*) The company shall have a president, vice-president, three or more directors and two or more auditors. (*b*) The president and vice-president shall be appointed by the Government; their term of office shall be four years. Directors shall be appointed by the Government from among the shareholders of the company; their term shall be three years. Auditors shall be elected from among the shareholders at a general meeting; their term shall be two years.

(5). Business: (*a*) Financing of and investment in gold mining and refining enterprises and in enterprises for the manufacture of gold mining and refining machinery and tools. (*b*) Gold mining and refining. (*c*) Buying and selling of gold mining and refining machinery and tools, and other materials or equipment. (*d*) Buying and selling of minerals containing gold. (*e*) Survey and valuation of gold mines.

(6). Debentures: (*a*) The company is authorized to issue debentures under the name of the Gold Production Promotion Debentures up to an amount five times the paid-up capital of the company. (*b*) The Government may guarantee the payment of the principal of and interest on such debentures.

(7). Dividends: (*a*) The company shall not be required to pay dividends on the Government-owned shares until private shares have been satisfied to the extent of four per cent per annum. (*b*) In case the profits to be divided among shareholders reach a ratio exceeding four per cent per annum on private investments and the company intends to declare dividends at a higher rate, distribution of such excess profits may be made on the Government shares and private shares at the ratio of 1 to 5, until the company becomes able to declare dividends of equal rates on both kinds of shares.

(8). Subsidization of dividends: When the amount of profits to be distributed among shareholders fails to reach the rate of four per cent per annum on private investments, the Government shall subsidize the company with an amount covering the deficiency for the first year of its operation and for the subsequent five years. However, each subsidy cannot exceed the combined total of a sum equivalent to four per cent per annum on private investments and a sum of interest paid on Gold Production Promotion Debentures, with the exception of the first one.

(9). Tax exemption: (*a*) The company shall be exempted from income tax and business profit tax for the first and the subsequent 10 business years. (*b*) No local taxes shall be levied on this company.

(10). Subsidies: The Government may grant subsidies to the company principally for its enterprises relating to refining of poor ores.

(11). Government supervision: (*a*) The Government is authorized to supervise the business of the company. The company is required to obtain approval from the Government regarding increase of capital, issuance of Gold Production Promotion Debentures, other borrowings, changes in the Articles of Corporation, disposition of profits, resolutions on amalgamation with other companies or dissolution, and business plans. (*b*) The company shall observe the Government's supervisory orders and orders necessary for the promotion of gold producing enterprises. (*c*) The Government shall appoint supervisors of the Nippon Gold Production Promotion Company in order to supervise the business of the company.

(12). Regarding the organization of this company, the Government shall appoint an Organization Committee, which shall make all preparations and follow the necessary procedures.

Gold Mining Industry in the Empire

The foregoing explanations apply to governmental policies in Japan Proper. In Korea, the Decree on Gold Production was promulgated by Imperial Ordinance No. 16 of September 7, 1937. This Decree is similar in substance to the Gold Production Law of Japan Proper. In Formosa, the Gold Production Law is to be enforced as in Japan Proper in accordance with Imperial Ordinance No. 518 of September 25, 1937.

The Japan Gold Production Promotion Company intends to increase the production of gold throughout the Empire. It will conduct business in Korea and Formosa as well as in Japan Proper.

Through all these endeavors, it is expected that the production of gold in the Japanese Empire will increase rapidly and that the new gold will be valued at several hundred million yen within a few years. To accomplish the purpose of the governmental plans large amounts of capital, various capital goods and a large number of technicians and skilled laborers are necessary. Full co-operation on the part of the people with the Government is deemed requisite to ensure successful expansion of gold producing enterprises.

To Work Tayeh Mine

Following the anticipated occupation of the Wuhan district by the Japanese Army, the Tayeh Iron Mine, in the eastern portion of Hupeh Province along the southern bank of the Yangtze, is expected to be brought under the management of the Nippon Iron Works. The same iron works some years ago extended loans amounting to more than 40 million yen to the Hanyehping Iron Mining Company on the security of the Tayeh Iron mine and with interest, the loans are said to have already reached 70 million yen.

The Tayeh Iron Mine is one of the largest iron mines in Central China, its deposit is estimated at 50 million tons at least. Iron produced from this mine is divided into three grades 62 per cent iron sulphide ore, 62 per cent red iron ore and 48 per cent brown iron ore. Although the annual output from this mine during the year 1931 is known to have been 425,000 tons, the annual production of one million tons is expected to be possible under the management of the Nippon Iron Works.

Manchuria's Electrical Communications*

Up until recent times, the electrical communication enterprises in Manchuria with the exception of the Kwantung Territory and the South Manchuria Railway Zone, had been far below those of other countries.

Upon the outbreak of the Russo-Japanese War, the Japanese military forces established a network of communication systems such as telegraphs and telephones to facilitate military operations. The great progress and accomplishments achieved in Manchuria during the twenty-seven years since the taking over of the administration and management of military communications by the Postal and Telegraph Bureau of the Kwantung Government in July, 1907, and the establishment on September 1, 1933, of the Manchuria Telegraph and Telephone Company which in turn took over the functions of the former, are indicated in the following table:

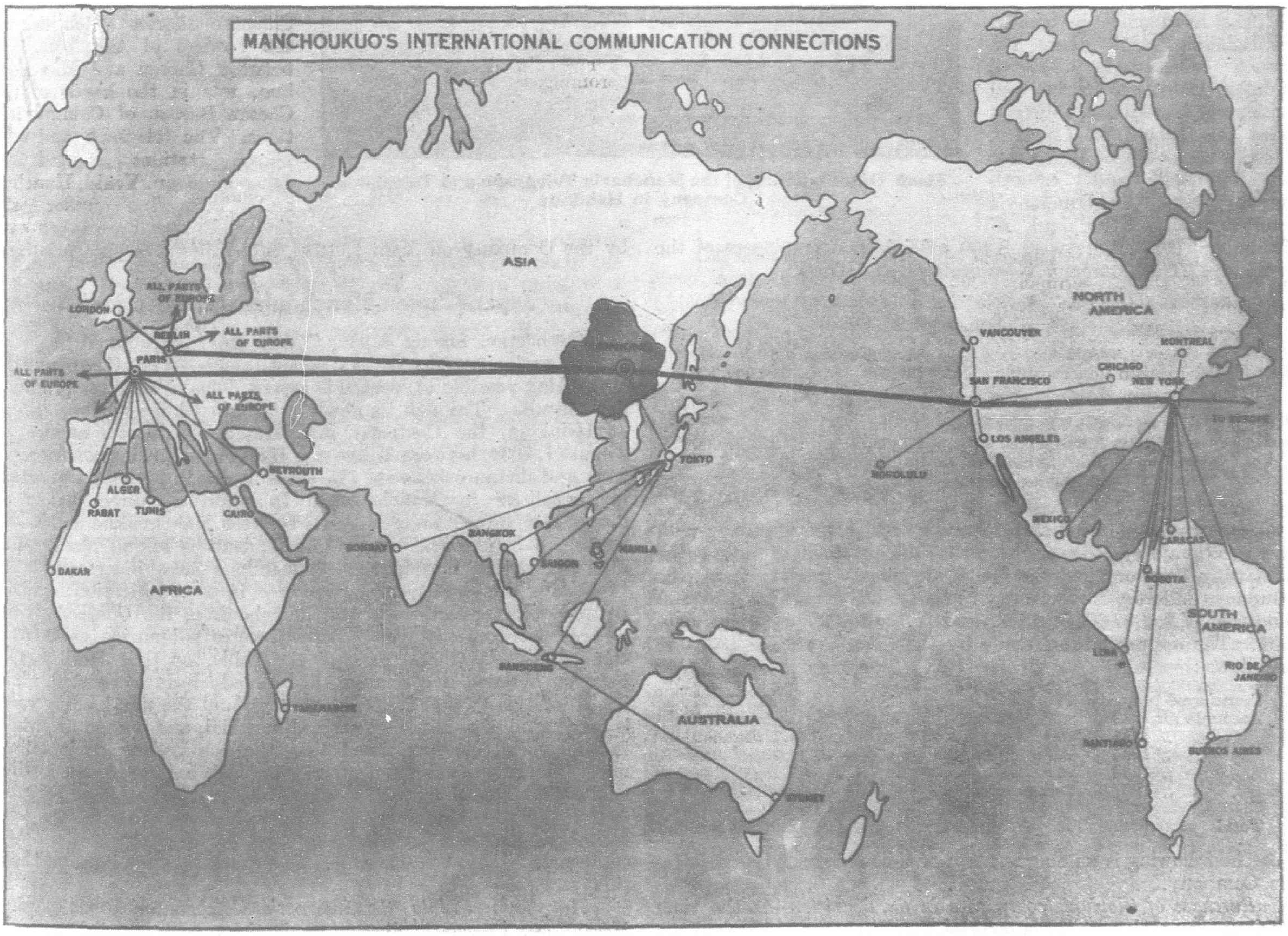
	1906	*1932*
No. of telegraph offices	44	214
No. of telephone offices	21	254
Total No. of telegrams sent and received ..	1,610,000	5,700,000
No. of long-distance calls	17,000	1,250,000
No. of telephone subscribers	785	21,255

The management of telegraphic, wireless and telephone operation had been conducted by many independent concerns, and consequently, the various establishments lacked uniformity. The frequent political disturbances and changes which took place with peculiar regularity in the past years, gave no opportunity to the enterprises for making further progress. Unification and control of the various communication organizations were not possible until the birth of Manchoukuo, but even at the present time, there are many telephone companies under hsien (county) management or operated by private firms, although it is expected that thoroughgoing control will be effected in the near future.

In comparing the scale of communication establishments and the use of the systems before the Manchuria Telegraph and Telephone Company was established, we find a wide disparity between those owned and operated by the Manchus and by the Japanese in Manchuria.

		Japanese	*Manchurian*
Telegraphs and long-distance telephone lines	Length of lines per square kilometer	700 meters	11 meters
	Aggregate length of lines per square kilometer	9,100 ,,	32 ,,
Use of telegraph per 100 population		450 messages	2.7 messages
No. of subscribers per 100 households		9.8 ,,	0.15 ,,

Upon the rise of Manchoukuo, the Japanese and Manchu circles felt a pressing need for the unification of communicative systems. The operation and management of establishments by the Japanese and Manchurians independent of each other, did not permit an efficient system, while the maintenance of equipment by both sides was considered unnecessary and wasteful. After a series of deliberations and negotiations, the governments of Japan and Manchoukuo decided to amalgamate the two systems and unify communications of the country for the benefit of all parties concerned, while positive plans for the improvement and increase of equipment were drafted. To execute the plans and to materialize the ideal of concerted Japan-Manchoukuo operation, a semi-



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* From *Contemporary Manchuria*.

official corporation, the Manchuria Telegraph and Telephone Company, was created.

Establishment of T. and T. Co.

By virtue of the "Agreement Concerning Joint Management of a Communication Company" signed between Japan and Manchoukuo, the Manchuria Telegraph and Telephone Company was established on March 26, 1933. The Company was entrusted with the management, improvement, unification and control of the communicative systems in the Kwantung Territory and Manchoukuo, and to assist in the expansion of industries, as well as in national development and defence. The Company therefore, has an important mission to fulfil.

A feature of the Company is that it is a semi-official organization with dual nationality, namely, Japanese and Manchoukuo. In consequence, the Company, besides enjoying many other rights that ordinarily belong to the government, is exempted from taxation, enjoys free use of transportation and communication facilities, the right to make charges for its services, and the right to construct lines and other establishments in the line of its operation. On the other hand, the Company is supervised by both the governments of Japan and Manchoukuo, while it must meet the demands of the Japanese and Manchoukuo armies, as well as anything that has to do with national defence. To supervise the affairs of the Company, there are five directors and three auditors selected with governmental approval, from among the Japanese and Manchu shareholders.

The head office is located in Hsinking while there are branch offices in Dairen, Mukden, Hsinking, Harbin and Tsitsihar. In addition, a district office is situated in Chengte. These various offices look after the interests and smooth functioning of the Company's enterprises. At the end of November, 1937, there were 8,400 officials and employees of the Company. The Company is capitalized as follows:

Head Office building of the Manchuria Telegraph and Telephone Company in Hsinking

Capital	Y.50,000,000 (1 share=Y.50)	
Government shares		
Japanese Government	330,000 shares	Y.16,500,000
Manchoukuo Government ..	120,000 ,,	6,000,000
Private shares		
Shares on which dividends are paid in yen (Class A)	450,000 ,,	22,500,000
Shares on which dividends are paid in Manchoukuo currency (Class B)..	100,000 ,,	5,000,000

Since the equipment and operations which the Company took over were in a very poor condition with the exception of those in the Kwantung Territory and the South Manchuria Railway Zone, the Company undertook vast improvement and expansion program allocating Y.2,000,000 in 1933, and Y.10,000,000 annually since 1934. The appropriations made by the Company since 1933 are as follows:

Transferred property	Y.21,358,414
Accounts for 1933	2,868,048
,, ,, 1934	11,012,652
,, ,, 1935	10,130,940
,, ,, 1936	10,647,134
,, ,, 1937 (first six months)	1,550,153
Total	Y.57,567,341

The following is an enumeration of the achievements made by the Company.

Purchase of telephone companies in the districts.—At the time the Company took over the enterprise, there were over 150 telephone offices under the management of hsien (county) governments and private concerns, while individuals with private telephones numbered 10,000. The scale of operations was small, and efficiency and quality of equipment varied widely. The Company did much to unify operations under a single system, and in 1934 succeeded in the annexation of telephone offices in Hailar, Tumen and Heiho, Tungliao, Yenki, Harbin, Antung, Yingkou, Loshan and Chiaoho in 1935, Hailun, Hunchun, Tunhua, Chiamussu, Fuchin, Tiehling, Ilan, Suihua, Hulan, Tunghua and Poli in 1936, and Liaoyang, Shuangcheng, Ningan, Taonan, Noho, Haicheng, Kaiping Shihfeng, Paichuan and Fuyu in 1937. All these offices, a total of 40 or more (with a total of 11,600 telephone subscribers) were purchased by the Company. The remaining ones in the outlying districts will also be incorporated in the near future.

Incorporation of the Communication facilities of the former North Manchuria Railway.—Following the transfer of the North Manchuria Railway to Manchoukuo from Soviet Russia, by virtue of the agreement signed on March 23, 1935, the Manchuria Telegraph and Telephone Company took over all equipment and establishments owned and operated by the former railway. Tremendous improvement was made on the existing facilities, while new offices were created at the important railway stations where there were no telephone or telegraph connection. In contrast to the inconvenience of connections between North and South Manchuria experienced in past years, the Company perfected an efficient communicative system linking the two regions.

Transfer of Chosen communications.—Telegraph and telephone administration in the Chientao district which lies on the borders of the boundary between Chosen and Manchoukuo, was in the hands of the Chosen Bureau of Communications. The telegraph and telephone stations located at Lungchingtsun, Yenki, Hunchun and Toutaokuo under the Chosen Bureau were taken over by the Company on April 1, 1936, after satisfactory negotiations.

Japan-Chosen-Manchoukuo Connections

Connection among Japan, Chosen and Manchoukuo has been plying with importunity in recent years. The Company did everything possible to meet this urgent demand and has produced good results. Through its newly established huge wireless station at Hsinking, the Company inaugurated radiophone service on August 1, 1934, between Tokyo and Hsinking, reducing considerably time and distance between 175 cities in Japan and the important municipalities in Manchoukuo. In addition, direct telegraph connections have been established between Manchoukuo and North Chosen, a region where great development is taking place, while direct telephone and wireless connections have been completed. Foreseeing a greater need for increase in communication facilities between Japan or Chosen and Manchoukuo, the Company commenced work recently on a long-distance submarine cable at a cost of Y.14,000,000. Part of the cable, or that land section between Mukden and Antung, has already been completed. The length of this section is 280 kilometers, and the non-loading cable is used, a novelty in technique and material, and unseen anywhere in the world. It is claimed that the non-loading cable enjoys many advantages over, and superior in many respects to the loading cable. The use of the non-loading cable marked another progress in the field of communications, and manifested once more the great technical skill and knowledge of the Japanese technicians and engineers. A great deal is expected of the cable upon its completion this year.

Advancement into the international communications field.—Heretofore, international communications were carried on only at Dairen through the Dairen-Chefoo submarine cable, and at Harbin where there were wireless connections with Peking, Tientsin and Shanghai. In February, 1935, the Company revived the Mukden-Tientsin telegraph service, while in June of the same year, telephone connections between the two cities were resumed.

Then in October, of the same year, an agreement was signed between Manchoukuo and China for handling messages in the Japanese language.

Correspondence with Europe and America was perfected in March, 1934, using pure Japanese material and equipment. Continuous two-way radio connections with Berlin and San Francisco are available at the Hsinking wireless station, while in December, 1935, direct two-way contact with Paris was inaugurated.

Modernistic studio of Radio Station JQAK, Dairen. It is managed by the Manchuria Telegraph and Telephone Company

Frequency of international messages handled is on the increase, but for the sake of brevity, only figures for the year October, 1936, to September, 1937, will be given here:

Messages sent . .	. . 275,551
Messages received	. . 269,537
Total . .	. . 545,088

Income from telegraphic, wireless and telephone services is also on the increase, but the fact that the increase in income does not correspond to the increase in the number of messages sent and received, is due to the substitution of the Japanese language for Chinese or European languages. The use of the Japanese language shortens the length of the messages, and reduces unnecessary expenses. Another reason is that wordings on telegrams have been simplified considerably.

Present Conditions of the Company

In comparison to the 363 (September, 1933) offices handling telegrams in Manchuria, the number has increased to 691 (at the end of 1937) since the formation of the Company, an increase of 328 offices. The various offices are classified as follows:

	1934	*1935*	*1936*	*1937*	*Comparison between 1936 and 1937*
Telephone and telegraph offices . .	75	95	124	187	+63
Telegraph offices	143	136	147	100	−47
Offices handling telegrams . .	222	243	249	275	+26
Offices handling both telegrams and telephone calls	2	6	7	4	−3
Offices handling telegrams and telephone messages	13	27	38	71	+33
Wireless stations	1	—	—	—	—
Stations handling wireless messages.	48	48	51	54	+3
Total	504	555	616	691	+75

In the following table is given the number of administrative districts under the management of the various branch offices of the Company. The extensive network of administrative units that has been laid in North Manchuria, goes to show that the Company is making remarkable progress and perfecting greater efficiency.

ADMINISTRATIVE DISTRICTS OF THE MANCHURIA TELEGRAPH AND TELEPHONE COMPANY

Year	*Dairen*	*Mukden*	*Hsinking*	*Harbin*	*Tsitsihar*	*Chengte*	*Total*
1936	133	150	153	102	53	25	616
1937	138	168	153	129	77	26	691
Increase . .	5	18	—	27	24	1	75

With the increase in the number of offices for the handling of telegrams, a surprising increase was seen in the number of telegrams handled. In 1930, there were only 4,770,000 messages sent and received, but in 1933 (the year the Company was established) there were 8,730,000; 10,340,000 in 1934, 21,750,000 in 1935, and 25,240,000 in 1936. Figures for 1937 are given below according to month.

NUMBER OF TELEGRAMS HANDLED IN 1937

(Number for September, 1933, taken as 100)

	No. of telegrams including relays	*Index No.*
January	2,108,848	186
February	1,817,412	160
March	2,602,892	230
April	2,332,195	206
May	2,310,300	204
June	2,195,934	194
July	2,461,168	217
August	2,506,889	221
September	2,479,517	219

INCOME FROM TELEGRAMS WITHIN MANCHOUKUO AND TELEGRAMS SENT TO JAPAN

(Unit: yen)

Year	*Internal Telegrams*	*Japan-Manchoukuo Telegrams*	*Miscellaneous*	*Total*
1933 (Sept. to Dec.)	463,690	484,553	1,355	949,598
1934	1,487,984	1,540,365	50,921	3,079,270
1935	1,804,687	1,608,816	42,862	3,456,365
1936	1,969,574	1,675,437	61,051	3,733,062
1937 (Jan. to Sept.)	1,637,776	1,419,000	34,978	3,091,754

INCOME FROM INTERNATIONAL TELEGRAMS

(Unit: yen)

Year	*Income*
1933 (Sept. to Dec.)	369,366
1934	1,176,948
1935	1,077,738
1936	1,061,555
1937 (Jan. to Sept.)	868,676

The number of minor offices attached to the various offices is given in the following table.

NUMBER OF EXCHANGE OFFICES (1937)

	Dairen	*Mukden*	*Hsinking*	*Harbin*	*Tsitsihar*	*Chengte*	*Total*
Telephone and Telegraph Offices	14	44	38	33	23	9	161
Telephone Offices	5	4	3	2	—	—	14
Offices handling telegrams and phone calls	1	—	1	3	2	—	7
Offices handling telephone affairs	—	—	2	1	—	—	3
Total	20	48	44	39	25	9	185

NUMBER OF OFFICES HANDLING TELEPHONE MASSAGES (1937)

	Dairen	*Mukden*	*Hsinking*	*Harbin*	*Tsitsihar*	*Chengte*	*Total*
Telegraph and Telephone Offices	17	47	40	35	24	9	172
Telephone Offices	1	1	1	1	—	—	4
Telegraph Offices	9	20	19	27	9	3	87
Telephone Exchange Offices	—	2	—	1	—	—	3
Offices handling telegraph and telephone affairs . .	1	—	1	3	2	—	7
Offices handling telephone and telegraph messages . .	16	20	13	17	12	3	81
Offices handling telephone affairs	—	—	2	1	—	—	3
Minor Offices handling telephone messages	28	6	14	9	5	—	62
Total	72	96	90	94	52	15	419

TELEPHONE SUBSCRIBERS ACCORDING TO NATIONALITY

Year	*Japanese*	*Manchu*	*Foreigners*	*Total*
1934	26,701	12,707	2,090	41,498
1935	32,424	17,634	1,169	51,227
1936	37,907	21,701	1,120	60,728
1937 (August)	42,446	25,660	1,143	69,246

The increase in the number of messages handled by the various offices as seen above is partly due to the steady increase in the number of telephone subscribers. The number of long-distance calls doubled the original figure in the five years, 1933 to 1937, or an increase from 1,350,000 in 1933 to 2,960,000 in 1937.

NUMBER OF LONG-DISTANCE CALLS

Year	*No. of Messages*
1934	2,103,497
1935	2,695,999
1936	2,958,268

Radio telephone calls handled by the Company is limited to North China at the present time, the number of messages averaging 700 per month, but in the near future, connections with South China are being contemplated.*

The following table gives the increasing income from telephonic services, but since the cost of subscription in cities is relatively high, leaving little room for further increase of subscribers, and since the rate of subscription in the smaller undeveloped cities is low, income from this source is expected to decline.

COMPARISON OF INCOME FROM TELEPHONE SERVICE

(*Unit : yen*)

	1934	*1935*	*1936*	*1937 (1st half-year)*
Charges for usage	3,715,759	5,076,279	6,070,464	3,145,927
Income from messages ..	2,168,916	2,928,841	2,935,172	1,729,228
Charges for special usage ..	103,300	154,481	211,861	142,786
Registration fee	104,302	85,709	83,817	25,730
Installation	1,551,944	1,223,260	1,188,504	340,960
Directories	13,557	20,972	28,104	17,997
Charges for transfers . ..	269,229	427,274	495,468	222,921
Miscellaneous income ..	22,609	26,675	248,364	236,028
Installation for police and national defence	4,986	5,060	8,564	4,138
Total	7,953,602	9,948,551	11,270,318	5,865,716

*Owing to the nature and nationality of the Manchuria Telegraph and Telephone Company, radiophone connection between Manchoukuo and Japan is considered an internal service.

Radio broadcasting stations.—The number and details of radio broadcasting stations under the management of the Company are as follows :

Station	*Call No.*	*Power*	*Frequency*	*Language of Broadcasts*
Hsinking	MTCY	10.00 kw.	560 kc.	Japanese and Chosenese
,, No. 2	MTCY	100.00 kw.	180 kc.	Manchu and Mongolian
Mukden	MTBY	1.00 kw.	890 kc.	Japanese and Chosenese
Dairen	JQAK	1.00 kw.	760 kc.	Japanese
,, No. 2	JQAK	1.00 kw.	1,065 kc.	Manchu
,,	JDY (short wave)	10.00 kw.	9,925 kc.	Japanese, Manchu and English
Harbin	MTFY	3.00 kw.	674 kc.	Japanese and Russian
Mutankiang	MTGY	0.01 kw.	1,015 kc.	Japanese and Chosenese
Chengte	MTHY	0.05 kw.	915 kc.	Manchu and Japanese
Antung	JQBK	0.05 kw.	805 kc.	Japanese and Chosenese

The short-wave station JDY at Dairen needs to be given special mention here due to the international position it has attained. This station was opened on July 17, 1937, and with broadcasts lasting 30 minutes beginning from 9:30 p.m., but since September 1, of the same year the length of broadcasts has been extended to 60 minutes beginning from 9:00 p.m. News topics in Japanese were added to the English and Manchurian broadcasts and various forms of entertainment such as radio-drama, music, etc., were added from time to time. From its modernistic studio standing on a low mound in the outskirts of Dairen, Station JDY calls forth nightly to its countless number of international radio fans throughout the world.

The following figures give the number of listeners of all races in Manchuria. (November, 1937)

NUMBER OF LISTENERS ACCORDING TO NATIONALITY

City	*Japanese*	*Manchu*	*Foreigners*	*Total*
Dairen	21,592	1,577	118	23,287
Mukden	19,795	4,191	76	24,062
Hsinking..	16,833	5,229	21	22,083
Harbin	7,546	2,382	645	10,573
Tsitsihar..	2,108	1,073	63	3,244
Chengte	728	472	3	1,203
Total	68,602	14,934	926	84,452

The latest figures (January, 1938) reveal that there are 93,859 radio listeners.

NUMBER OF LISTENERS ACCORDING TO YEAR

Year	*Total No.*	*No. of Increase*	*Percentage of Increase*
1933	7,995	2,196	37.9%
1934	12,386	4,391	55.0%
1935	19,764	7,378	59.6%
1936	41,202	21,438	109.0%
1937 (November) ..	84,452	43,250	104.9%

One must not overlook the fact that there are 93,000 radio listeners out of the 37,000,000 Manchurian population. There are only 40,000 listeners out of a total population of 350,000,000 in India, which goes to show that Manchoukuo is making tremendous progress as a modern civilized state in the Far East. It is especially noteworthy in that the rate of increase is very sharp. This can be seen by glancing over the following table, but the marked progress in this field not only narrates the progress of Manchoukuo, but at the same time it is an unparalleled advancement in the history of modern civilization.

COMPARISON OF INCREASE IN THE NUMBER OF RADIO LISTENERS ACCORDING TO NATION

Country	*1935*	*1936*	*Rate of Increase*
England	7,403,109	7,914,506	6.91%
Germany	7,192,952	8,167,000	13.55%
France	2,625,677	3,218,541	22.58%
Poland	946,844	989,115	4.46%
Sweden	834,143	944,487	13.23%
Czechoslovakia ..	847,955	928,112	9.45%
Belgium	746,395	890,323	19.28%
Denmark	609,226	652,255	7.06%
Austria	560,120	593,815	6.01%
Italy	530,000	622,962	17.54%
Switzerland	418,499	464,332	10.95%
Hungary	352,907	365,354	3.53%
Norway	191,378	240,251	25.54%
Finland	144,721	177,376	22.56%
Rumania	127,041	162,766	28.12%
Latvia..	82,175	96,331	17.23%

Nations with a total of 80,000 or more are listed in the above table.

Although information is still inadequate, the different programs of broadcasts for the month of March, 1937, are given in the following table :

	Dairen		*Mukden*		*Hsinking*				*Harbin*		*Total*		
	No. of times	*Total No. of minutes broadcast*	*No. of times*	*Total No. of minutes broadcast*	*No. of times*	*Total No. of minutes broadcast*	*No. of times*	*Total No. of minutes broadcast*	*No. of times*	*Total No. of minutes broadcast*	*No. of times*	*Total No. of minutes broadcast*	*Percentage of total broadcasting time*
News	954	5,363	757	5,003	894	5,286	518	3,423	843	5,248	3,966	24,322	28.5%
Educational and cultural	200	4,315	189	4,195	267	5,006	189	3,663	206	4,666	1,051	21,845	25.5%
Children's hour	64	888	71	971	60	758	63	689	67	888	325	4,194	4.9%
Musical program	104	2,684	100	2,543	117	2,918	18	543	103	2,348	442	11,036	12.9%
Radiodrama	79	2,354	80	2,284	70	2,114	279	6,896	43	1,388	551	15,036	17.6%
School broadcast	35	545	—	—	—	—	14	276	—	—	49	821	1.0%
Advertisements	49	104	47	94	59	121	16	32	51	102	222	453	0.5%
Miscellaneous	44	1,176	151	1,775	71	1,229	—	—	196	3,555	462	7,735	9.1%
Total	1,529	17,429	1,395	16,865	1,538	17,432	1,097	15,522	1,509	18,195	7,068	85,443	100.0%
Average per day	49	562	45	544	49	562	35	500	48	586	228	2,756	—

With the passing of time, the scope and field of broadcast functions are ever on the expansion and increase. As a result of diligent efforts of the Company, broadcasts on international hook-ups especially with European countries (not to mention Japan) are now possible, an indispensable agency in the exchange of culture and goodwill. The broadcasts on international hook-up that have taken place last year are listed below.

February 7.	United States-Japan international musical program (Goodman's jazz music) CBS, New York.
February 16.	United States-Japan international musical program directed by Viscount Konoye. NBC, New York.
April 25.	Address by Yin Ju-keng of the East Hopei Autonomous Government. From Tsungchow.
May 3.	Coronation Broadcast from London.
June 2.	Broadcast of the Japanese Economic Mission to America. From New York.
June 19.	10th Anniversary Broadcast of the German-Japanese Cultural Society. From Tokyo and Berlin.
June 22.	Japan-Germany international musical program directed by Yamada Kosaku. From Berlin.
July 5.	American Independence Day international broadcast. From Tokyo and New York.
November 25.	Japan-Germany international musical broadcast. From Berlin.
November 25.	Broadcast commemorating the first anniversary of the Anti-Comintern Pact. From Berlin and Tokyo.
December 24.	Establishment of the Provisional Government, Peking. From Nanhai Park, Peking.

During the four and half years since the founding of the Company, the number of radio owners increased by fourteen times, but the cost of operation cannot be met by the one yen fee charged on all listeners, and charges for advertisements (which totalled Y.43,410 between January to November, 1937), resulting in an annual deficit of several hundred thousand yen. Since the management of radio stations is an important function, the Company is trying its very best to remedy the situation.

Plans of the Company for 1938

Owing to the present emergency situation, the Company is pushing forward assiduous plans that require immediate attention, while those of less urgent nature are expected to be laid aside for a while. In communication, approximately Y.6,830,000 will be spent, and Y.210,000 in miscellaneous enterprises, bringing the total to Y.7,040,000 while Y.1,000,000 will be held in reserve to meet deficits and items not accounted for, for the purchase of local telephone system, and for air-defence expenses.

This year's plans call for the following:

Communications.—Increase of multiple lines and expansion of systems are given great importance, since communication is an indispensable factor in the development of interior regions. Six additional two-way lines will be set up in North and South Manchuria while extension work will be continued on the Antung-Mukden cable, and the establishment of return lines on the Osaka-Dairen and Tokyo-Mukden connections. Furthermore, two-way equipment will be installed in various districts of North Manchuria with the view to linking minor towns and regions with the larger towns and cities.

In parallel with the expansion and increase of facilities and establishments, much attention is being given to bettering efficiency of administrative and management functions. Pressed by the tremendous increase of population throughout the country, and by the great progress seen recently in railways and industries, 50 new telegraph offices will be established in the near future.

Other plans include the reconnecting of two-way lines at fifty or more different places, modification of the transmitting system, increase of apparatus and equipment, expansion and improvement of wireless, establishment of better connections, with Europe and America with the supplementation of equipment, establishment of telegraph connection with Tientsin, over-hauling of 300 kilometers of defective lines, and many other items calling for expansion, increase or improvement.

Telephone.—In reply to the great demand for long-distance telephone connections in localities, single lines will be newly laid in all parts of North Manchuria, while 20 telephone offices will be created to take over direct management and connections of the systems. In co-operation with the plans of the Manchoukuo Government for the expansion of police communications, the Company will remove defective lines and equipment and replace them with new ones in North Manchuria to effect a modern long-distance telephone system for police and civilian use.

Radio Stations Planned

In response to the great demand in all parts of the country, 3,200 automatic telephone offices and 2,300 exchange offices or a total of 5,500 offices will be created anew, and at the same time, the number of subscribers will be tremendously increased. Communicative systems and operating efficiency will be greatly improved.

Small radio stations will be established at Chiamussu, Yenki and Harbin, while a 10 kilowatt short-wave station will be created at Hsinking for international broadcasts in co-operation with the stations in existence throughout the country. A receiving station will also be installed at Chiamussu. New buildings for the telegraph and telephone offices will be constructed at Chiamussu, Chengte and Yenki, together with smaller buildings for various offices and localities. Moreover, equipment for offices will be installed, residences will be built, and equipment in general and for warehouses will be installed.

In conclusion, a table of appropriations which will be made by the Company in the various fields this year is given below.

APPROPRIATIONS FOR 1938

Communications	Y.453,264
Radio Establishments	11,704
Buildings—construction of Chiamussu Radio Broadcasting Station	5,880
Equipment for the above	5,824
Buildings	441,560
Buildings for Chiamussu, Yenki, Chengte offices, and small buildings	437,528
Enclosures for offices and buildings	4,032
Miscellaneous—Residences	98,560
Land (Chengte and others)	26,880
Construction costs	67,200
Minor constructions	4,480
Total	Y.551,824

Manchoukuo Plans Lumber Company

The Manchoukuo Government, at a meeting of the State Council held here in September, decided on the general principles for the establishment of a large lumber company in this country, with a view to exploiting the forestry resources in North Manchuria, particularly in the Great and Small Hsingan Mountain regions, for the pulp industry. Aiming at developing the same industry, four pulp companies in East Manchuria and reed and bean pulp companies are already operating in this country. According to the scheme of the Industry Ministry of the Hsinking Government, the projected company will be capitalized at 100 million yuan, to be capable of producing 230,000 tons of different kinds of pulp annually by 1942. The tentative plan for the establishment of the company, which has been approved by the State Council, will be further deliberated upon by a special committee to be formed shortly and the company is expected to be organized within the year. The plan drafted by the authorities of the Industry Ministry is in substance as follow:

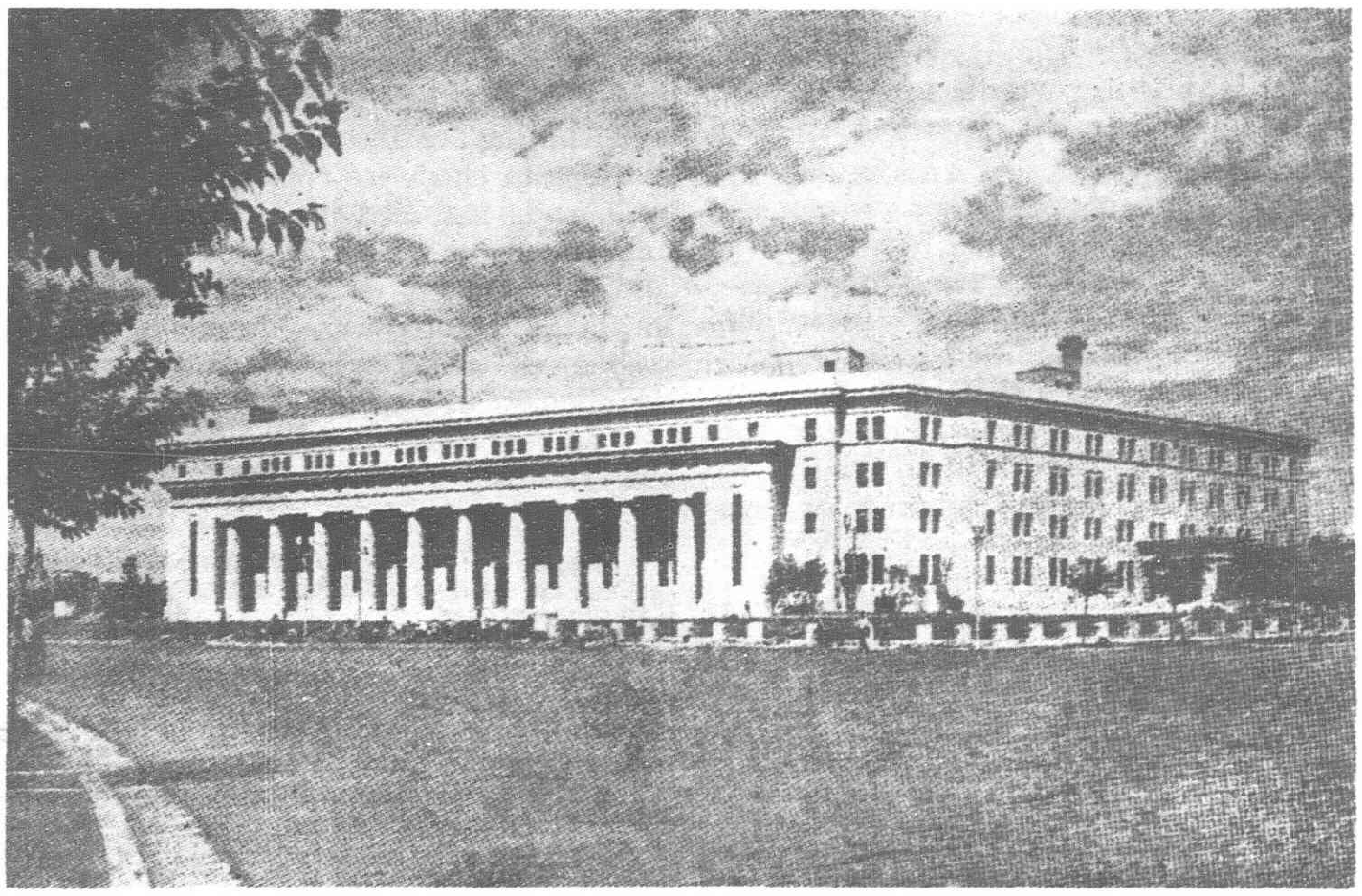
It has been decided, by undertaking large-scale exploitation of the forests in the Great and Small Hsingan Mountain areas, to obtain about 299,000 koku of timber for the pulp industry and 250,000 koku for other purposes by 1942.

Manchoukuo's New Bank

Giving the impression of solidity and strength, the new head office of the Central Bank of Manchu in Hsinking, which has been completed, was opened on August 15. Built on a site covering 30,000 square meters (9,075 tsubo), the new building stands as a monument to the energy of the Japanese and Manchoukuo leaders, whose far-sighted policies have been instrumental in transforming the once characteriess gloomy town of Changchun, as Hsinking was called in the days when Manchuria was ruled by war-lords, into a majestic new metropolis built along modern and dynamic lines—a city befitting the capital of a new and progressive state.

Facing Tatung Circle, the heart of Manchoukuo's capital, and grouped in with the other handsome modern Government and semi-official buildings which have sprung up around it, the Central Bank's new head office is one of the most beautiful and impressive structures that has been built in the city so far. A steel and re-enforced concrete brick (curtain wall) structure in the classical style of architecture, it is four stories high with two basements, and has a total floor area of 26,075,467 square meters (7,887,829 tsubo). The floor space of the first story is 5,677,492 square meters (1,717,441 tsubo), of the second story 3,105,742 square meters (973,998 tsubo), the fourth story 3,882,819 square meters (1,175,553 tsubo), the roof 413,000 square meters (124,933 tsubo), the first basement 5,801,492 square meters (1,754,951 tsubo), and the second basement 4,094,102 square meters (1,138,466 tsubo). The height of the building from the ground to the top of the parapet is 21.50 meters, with an additional six meters to the top of the elevator towers protruding from the roof. The structure is earthquake and fire proof and its construction cost is believed to run into several million yen (public announcement of exact cost withheld).

The exterior of the building is finished with Manchurian granite. All windows and entrances are equipped with steel sashes and doors of handsomely decorated steel. Ten massive granite pillars stand guarding the front entrance to the building.



The stately new four-story building of the Central Bank of Manchu on Tatung Circle, Hsinking

Artistic Interior

The interior of the structure is artistically designed, with the adoption of the best offered by Occidental banking houses. The floor of the large business office on the first story is covered with linoleum tile, while the walls and large pillars are of marble known as torapachin, produced in the Loochoo Islands. The counters and huge blocks supporting the pillars are of Italian marble. The ceiling is finished with plaster beautifully designed into squares. There is a beautiful glass dome in the center of the ceiling, the glass being specially imported from Germany. The office room is floored with linoleum. It has painted plaster walls in the lower part, with the upper part and ceiling finished with calsomined plaster.

The floors of the special guest room, the president's office and the vice-president's office, which all have mantelpieces of Italian marble, are finished with hardwood of fine grain. The lower part of the walls of the special guest room is of Japanese marble, while the upper part is covered with satin damask, and the ceiling finished with cypress coated with paint. The lower section of the walls of the president's office is finished with teak veneer coated with lacquer, and the upper section and the ceiling with plaster, the latter being decorated with carvings. The walls of the vice-president's office are also of teak veneer coated with paint in the lower portion, with satin damask covering the upper portion, while the ceiling is ornamented with painted plaster carvings. The directors' offices are floored with linoleum tile, with lacquered Nara veneer covering the lower part of the walls, and the ceiling decorated with painted plaster carvings.

Every modern convenience and device has been installed to bring the building right up-to-date and produce 100 per cent efficiency in carrying out all business. Careful attention has been paid throughout to ventilation, sanitation, lighting, heating, etc. All wires for electric light, telephone and electric clocks have been placed in conduits, and all pipes for the heating apparatus, water supply, both hot and cold, drainage and other up-to-date equipment have been built in and provided with protection against heat and cold, inside the main construction. Seven elevators run from the main floor to the roof. The sanitary arrangements are of the latest design and construction. The building is also equipped with paper note burners, carriers for sending papers and documents between the various offices, device for sounding fire and burglar alarms, and Diesel engines for generation of its own electric power.

Three Smaller Structures

In addition to the main building there are three separate smaller structures comprising the printing plant and office, a garage and a storehouse. The printing plant and office has three stories and a basement, totalling 2,585,600 square meters (782,144 tsubo) in floor area, with the first and second stories occupying 1,032,000 square meters each, the third story 319,200 square meters (96,558 tsubo), the roof 20,400 square meters (6,171 tsubo), and the basement 182,000 square meters (55,055 tsubo). The garage and the storehouse have floor spaces of 467,298 square meters (141,358 tsubo) and 563,760 square meters (170,537 tsubo) respectively. The aggregate floor space of all the structures, including the main building, is 29,692,125 square meters (8,981,868 tsubo).

The Central Bank of Manchu was established on June 15, 1932 on a special charter, with a capital of 30,000,000 yuan. Besides note issue, and the maintenance of the stability of the currency, the bank has the duty of handling public money and transacting general banking business. The bank is operating 150 branches in Manchoukuo and one in Tokyo. The network of correspondents covers leading cities in Europe and America, as well as in China and Japan.

Among the achievements of the bank may be mentioned (*a*) unification of currency (*b*) stabilization of the currency in the country and (*c*) formation of organs for supplying credit to the masses besides functioning as a Central Bank, and the general business succeeded to from former provincial banks, which were amalgamated with it.

Spanning the World with Air-Lines

Britain's Trans-Pacific Program will Link the Far East into its Unique Airways Organization

(Written Specially for The Far Eastern Review)

Britain, this year, is sending three types of 'plane across the Atlantic in a series of fifteen flights in preparation for the establishment of regular mail—and passenger-carrying services from England to America.

That may appear to have only a technical interest for the Far East, but, in fact, it has a very real and practical significance for everybody on the Western shores of the Pacific.

The Atlantic program is definitely associated with the problem of trans-ocean flying in all quarters of the globe, and the data recorded on these first commercial flights across the Atlantic will be extremely useful on such trans-ocean crossings as the Pacific and the Tasman Sea.

Atlantic Program

The Atlantic program this year began with the record-breaking Southampton-New York flight of *Mercury*, upper component of the Short-Mayo Composite aircraft, and her return to England via the Azores and Lisbon.

No other country in the world has announced such an extensive program of pioneer flights, and the data which is being collected should be an important contribution not only to the British air-line concerned, Imperial Airways, but also to Pan American Airways, which will operate a service across the Atlantic when it has the requisite aircraft available.

The British flights across the Atlantic will be made by four aircraft which belong to Imperial Airways and the Air Ministry. The schedule includes six crossings by the *Mercury*, four by Imperial *Cabot* (a development of the Imperial " C " class flying-boats, thirty of which are now operating the Empire air routes) and five crossings by *Albatross*, a land 'plane which will cruise at about 210 miles an hour and is specially designed for long-distance flying.

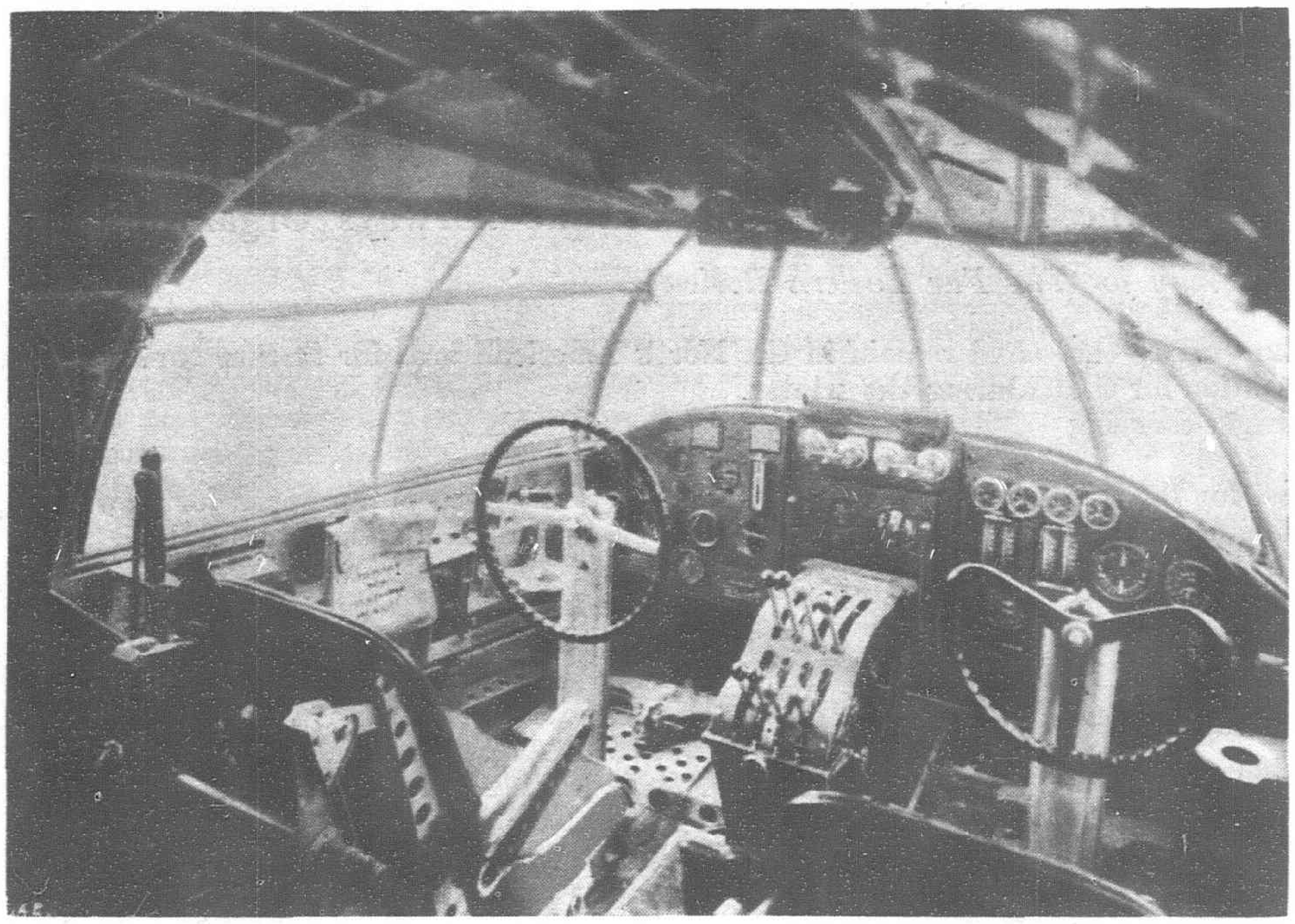
The odd number of crossings is accounted for by the fact that one of the Albatross type of aircraft will fly to New York in October and remain in the North American area for further survey flights during the winter.

The detailed program is :

July	15-20 :	*Mercury* to leave Southampton for New York, via Foynes, Botwood and Montreal
July	21-28 :	*Mercury*, to leave New York for Montreal, Botwood, Azores, Lisbon and Southampton.
August	15-20 :	*Mercury* to leave Southampton for New York, via Foynes, Botwood and Montreal.
August	21-28 :	*Mercury* to leave New York for Montreal, Botwood, Azores, Lisbon and Southampton.
September	1-10 :	*Albatross No. 1* to leave Hatfield for New York, via Collinstown, Hatties Camp and Montreal.
September	11-16 :	*Albatross No. 1* to leave New York for Montreal, Hatties Camp, Collinstown and Hatfield.
September	20-25 :	*Cabot* to leave Southampton for New York via Foynes, Botwood and Montreal.
September	26-30 :	*Cabot* to leave New York for Botwood, Foynes and Southampton.
October	10-15 :	*Cabot* to leave Southampton for New York via Foynes, Botwood and Montreal.
October	16-21 :	*Cabot* to leave New York for Montreal, Botwood, Foynes and Southampton.
October	1- 5 :	*Albatross No. 1* to leave Hatfield for New York via Collinstown, Hatties Camp and Montreal.
October	6-11 :	*Albatross No. 1* to leave New York for Montreal, Hatties Camp, Collinstown and Hatfield.
October	5-10 :	*Albatross No. 2* to leave Hatfield for Collinstown and Hatties Camp.
October	15-20 :	*Mercury* to leave Southampton for Foynes, Montreal, and New York, calling at Botwood if necessary.

—Photo from Flight

Here is first of the fleet of the 250 m.p.h. air liners ordered by Imperial Airways and the Air Ministry for Trans-Atlantic and European Air Routes. This class liner with top speed around 250 miles an hour will cruise at about 210 m.p.h. It represents the fastest large-scale passenger-carrying aircraft built in Britain for commercial operations ; designed to carry 22 passengers on route from London to Paris. Two classes of type have been produced—one for Trans-Atlantic crossings in summer program of 15 flights and the other for the London-Paris Express Service of Imperial Airways.



Here is control cabin of the "Maia"—mother craft in Imperial Airways pick-a-back Mayo Composite Aircraft—from which the seaplane "Mercury" is launched on her record-breaking Atlantic flights. Indicators for mechanism releasing "Mercury" are seen in center of cabin roof, throttle and mixture controls at hand level and other navigational instruments in dashboard. Particularly interesting is this new development in Aircraft Technique

October 21-26: *Mercury* to leave New York for Montreal, Botwood, Azores, Lisbon and Southampton.

Imperial *Cabot* is the first of a fleet of eight new flying-boats which will be identical in appearance with the standard Imperial flying-boats now on the Empire routes, but will be stressed to carry an extra eight tons.

The *Albatross* is a four-engined land-plane, two of which have been ordered by the Air Ministry from the makers, the de Havilland Aircraft Company. A fleet of these aircraft, specially adapted for operation on the European routes of Imperial Airways, will also fly between London and Paris.

The type includes many interesting features, and will represent the fastest luxury liner yet produced in an English aircraft factory.

The *Mercury*, of course, has already proved that it is an extraordinary advance in commercial air-line technique, and even now news is to hand that a land-plane type of the same aircraft, with a cruising speed of between 270 and 300 miles an hour, is designed.

The establishment of an air-line service between England and America will mean the forging of one of the last links in the complete chain of British air lines around the world.

Under the Royal Air Force pioneering at the end of the War, the first regular mail and freight service on the Empire routes was begun in 1921—Cairo-Bagdad.

The route was across vast tracks of desert bare of land-marks and, aerial navigation being then in its infancy, a deep furrow had to be ploughed across hundreds of miles of wasteland as a guide line for pilots.

This pioneer route really created the idea of the greatest air-mail scheme in the world—the carriage by air of all first-class mails without surcharge—under which system more than 1,500 tons of letters are carried by Imperial Airways each year.

Actually, Imperial Airways was formed in 1924, when four civil air companies were amalgamated to form one organization, which the British Government selected as its chosen instrument for civil air transport development.

The Company immediately began to examine the prospects of connecting Great Britain with the overseas Empire, but it was not until 1926 that the Government really decided that the Company should concentrate on Imperial routes.

Despite difficulties (of international politics rather than of air line operation) Imperial Airways had completed its plans for the first section of the London-India-Far East service, Cairo-Karachi, by 1926.

The project was held up by the restrictions on operation along the Persian side of the Persian Gulf, a problem not overcome until 1929.

But in December 1926 Imperial Airways took over the Cairo-Bagdad service and extended it to Basra on the Persian gulf.

A special fleet of three-engined air-liners had been constructed for the route and a complete and permanent ground service organized. Then, because mails alone did not make the services economically justifiable, it was decided to carry passengers and freight.

Passenger Problem

Passenger traffic demanded far-reaching developments in the design of the planes and the scope of the ground services. Comfort and space had to be reconciled with commercial speed. Day stages on the route had to be adjusted so that passengers would not be wearied by undue travel in 'planes which then had not reached the standard of quiet and comfort of the modern air-liner of to-day. Meals and sleeping accommodation had to be provided at points where none existed.

In one instance the airport and rest house had to be constructed in the form of a fort as protection against the Nomad tribes. Because of the unfriendly and sparsely populated terrain, too, new radio equipment had to be perfected for use in case of forced landings. Transmitters had to be evolved to work when the machine was on the ground as well as in the air—at that time a new problem.

Locked petrol dumps were established in the desert. In case of landing in inaccessible spots, too, "iron rations" of food and drinking water sufficient to last for some days were put on each 'plane, incidentally only used on two or three occasions since the desert service began eleven years ago.

In these and other ways that first section of the Australian route saw and speeded progress to to-day's high standard of safe and regular commercial aviation.

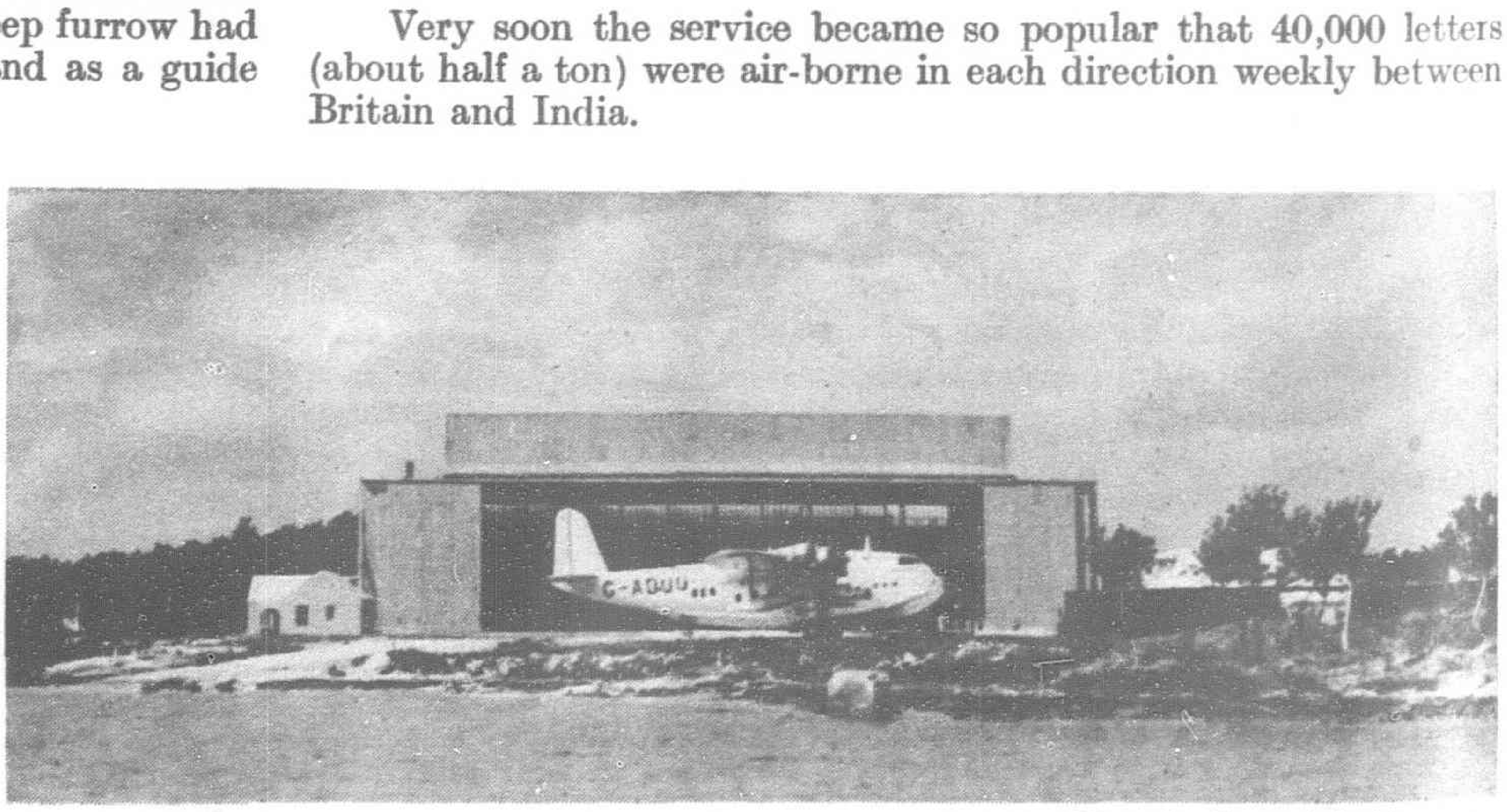
In 1929 negotiations with Persia for the eastward extension and plans for the connection between London and Cairo came to fruition simultaneously.

It was thus possible to extend the service into a 5,000 miles route connecting Britain, Palestine, Iraq and India—the first regular service from Britain to any part of the Empire.

This first service operated satisfactorily for nearly a year and brought India within seven days of London, enabling letters to reach India and be answered in the time which a letter took for the single journey by surface transport.

Quick Growth

Very soon the service became so popular that 40,000 letters (about half a ton) were air-borne in each direction weekly between Britain and India.



—*Photo by Imperial Airways*

Imperial Airways Empire flying boat "Cavalier" at Bermuda

That is small compared with Imperial Airways' great loads of air-mail, to-day, but it showed the need and the possibilities for future development.

Simultaneously, the route was shortened in 1931, by a day, by flying from Athens to Tiberias on the Sea of Galilee and then direct to Bagdad, thus cutting out Egypt to which a branch line Tiberias-Cairo was run.

The schedule was now six days London-Karachi.

Then more difficulties with Persia arose and another route down the South coast of the Persian gulf was surveyed. This Arabian coast route was brought into service in October 1932 with land-planes calling at Bahrein and Sharjah.

It was roughly the same route as the existing services Southampton-Hongkong now use.

Difficulties were experienced in India in the planning of extensions beyond Karachi. A temporary service from Karachi to Delhi was run with 'planes chartered by the Indian Government. The arrangement terminated in December, 1932, and the Delhi Aero Club continued the line with light 'planes. A big commercial concern in India organized a similar service to Bombay and Madras.

Extensions

In July 1933 the air-mail service was extended from Karachi via Jodhpur, Delhi, and Cawnpore to Calcutta and later in the year extensions were made to Rangoon (in September) and Singapore (in December).

The trans-Indian services were operated by Indian Trans-Continental Airways, a company for which the capital was subscribed by Imperial Airways Limited, the Government of India, and an Indian transport company.

Meantime the establishment of the England-Hongkong air route, one of the longest in the world, was in hand.

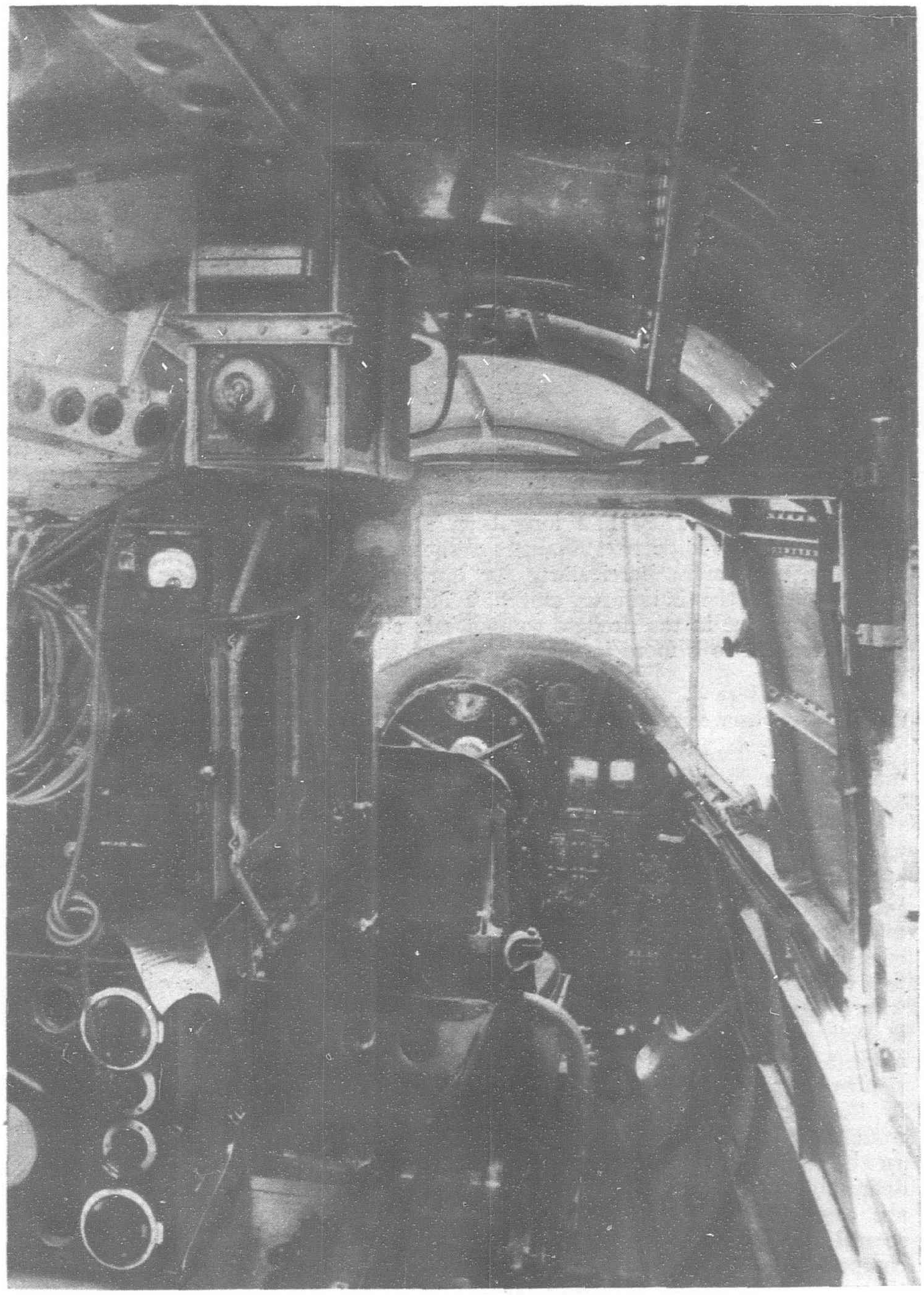
The first regular service was flown to Hongkong from England in March, 1936, the route being through Penang, Saigon and Tourane on a once-weekly schedule.

In December of last year the route was altered to go via Bangkok, Udorn, Hanoi and Fort Bayard. In the early part of this year the service was doubled to provide two flights each way between Bangkok and Hongkong every week.

Thus the Far East was linked closer into the colossal network of the 30,000 miles of air route operated by Imperial Airways and its associate companies.

Now there are eight services each way between Egypt and England, five between India and England, three right through to Sydney and to Central Africa, two to Hongkong and to South Africa and one to West Africa.

Such frequency of services forms a fundamental part of the Empire mail scheme, for it ensures an even flow of mail to and from the homeland, thus making the old "mail-day" obsolescent.



Here is the compact control cabin in which Imperial Airways "Mercury" is guided across the Atlantic in her record breaking flights. Donald C. T. Bennett, Australian, occupies the pilot's seat, forward, and Alan Coster, wireless operator, sits at the radio controls which are seen at left, "Mercury's" Trans-Atlantic flights have stimulated great interest along the Imperial Air Routes and have an important bearing on such Trans-Ocean Routes as those being prepared for the Tasman Sea and the Pacific

Accelerations

Not only the frequency but the speed of services has been markedly increased. For instance, by the latest acceleration in April, Hongkong was brought within five days six hours of London compared with over seven days on the previous schedule.

At the same time re-scheduling provided additional speedy connections with other parts of the Empire.

The Wednesday service out of Bangkok for Hongkong was deliberately planned to give Australia and Malaya a direct air connection with China, through the west-bound flying-boat service from Singapore arriving at Bangkok on Tuesdays.

Similarly, the service leaving Hongkong on Mondays connects with the east-bound as well as the west-bound service leaving Bangkok on Tuesdays. Thus, leaving Hongkong on Monday a passenger can get to Singapore by mid-day Tuesday and be in Sydney by the end of the week.

Or, going westward, he can reach Calcutta by 10.40 on Wednesday morning, take the next morning's flying-boat back and be at Hongkong on Friday.

Substantial as these accelerations are, improvements will continue to be made, particularly on the Hongkong-London route, as night flying organization is improved; and indeed the original scheme provides for a seven days service between London and Sydney which will almost certainly be accompanied by still further reductions in the time of London-Hongkong services.

Unsurcharged Air Mail

The introduction of the all-up mail scheme whereby all first-class mail matter is carried by Imperial Airways without surcharge, marked another important advance in Britain's civil aviation.

The Imperial flying-boat *Canopus*, now familiar along the Empire trunk routes to South Africa and Australia, made her

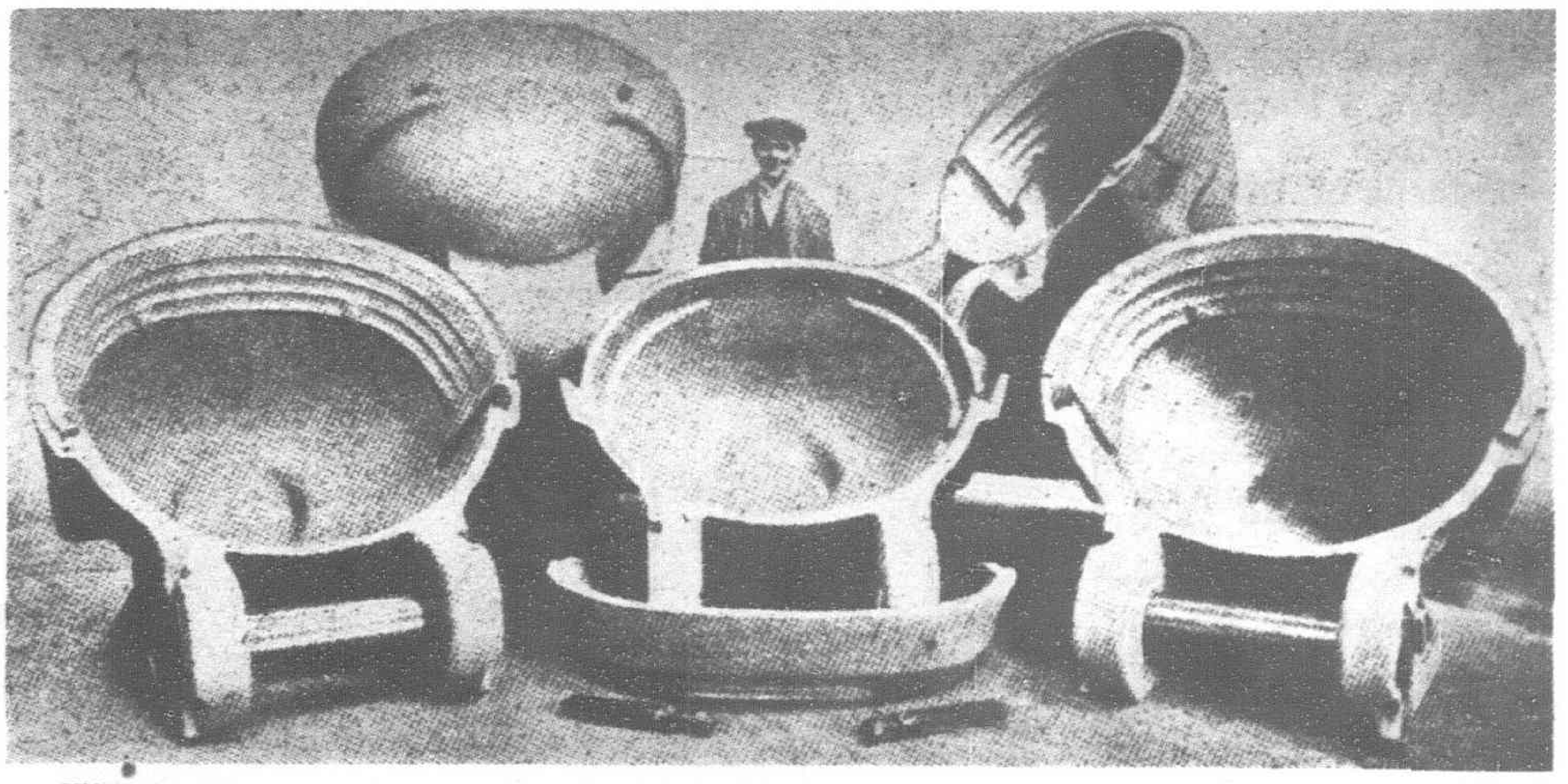
(*Continued on page 350*)

Tin Mining Practice in Malaya*

The remarkable advance in tin dredger practice and in the design and construction of tin dredgers during the last 20 years or so has called for an equally remarkable advance in the design and construction of the various component parts of placer dredgers. In the early days of tin dredging, for instance, the buckets were rarely more than 5 cu. ft. capacity, and invariably built up from mild steel plates riveted together, or at the most cast steel backs with mild steel hoods, but when the method of extraction of the tin bearing sands by dredging had been shown to be a practical proposition and was becoming definitely established, it quickly became apparent that something better and more reliable was called for. It was at this period that Hadfields, Ltd., of East Hecla Works, Sheffield, came definitely into the picture. They had long been known throughout the dredging world as important suppliers of such parts as pins, bushes, tumblers, etc., more particularly for harbor dredgers, but the development of the tin industry and the evident need for corresponding development in the dredger components caused them to turn their attention to a more intensive study of the problem.

Manganese Steel Buckets

One of the immediate results was the introduction of the "Era" manganese steel bucket, cast solid, with a renewable lip of the same special material. "Era" manganese steel had already been proved to be the most suitable and economical material for use where conditions involving intense wearing action were encountered, and it was very speedily evident that its application to dredger buckets in the form indicated would be a pronounced success. This has definitely proved to be the case, and there is scarcely a tin dredging company in the East that has not had experience of the Hadfield manganese steel bucket, and found it to give not only complete satisfaction, but also to confer advantages in the operation of the bucket line that at one time would have been thought impossible.



The largest made manganese steel buckets for tin dredging, which have an 18 cubic feet capacity

In the early days of the "Era" manganese steel bucket, the capacity was more or less confined to about 7 cu. ft., but as the development proceeded and as greater experience was gained, buckets of larger capacity were demanded and successfully supplied. Seven cubic feet buckets gave place to 9 cu. ft. buckets, 9 cu. ft. to 10 and 10½, 10½ to 15, and so on, until in recent times buckets so large as 18 cu. ft. capacity have not only been required, but have been furnished with unqualified satisfaction, in fact, 22 cu. ft. buckets have been designed, and are only awaiting the time when further developments in dredger construction necessitate their manufacture and installation.

Simultaneously with the increase in the size of the buckets, improvements have taken place in their design. The shape of the bowl, the method of bushing, the pin fitting, the practice as regards the method of adjustment and renewal of the lips, and many other features have all been successfully reviewed, developed, and improved upon, so that the "Era" manganese steel bucket to-day may well be regarded as the last word in efficiency and reliable construction.

Among the modern features worthy of particular note are the method of bushing the back eyes with full circular bushes, the various forms of pin locking devices, such as the "Kent," "Johnson," "Blackie," reversible pins such as the "Aitken" and "Templeton," and the "Hecla" renewable rivetless bucket lip, which dispenses with the use of rivets as a means of adjustment, many of which are protected by patents, and regarding all of which Hadfields are prepared at all times to give any further information that may be called for.

As will well be appreciated, developments of this nature could scarcely take place so far as the buckets are concerned, without corresponding developments in the way of tumbler practice. In regard to these, probably the greatest changes have occurred in the design and construction of bottom tumblers, but in every case extensive employment has been made of "Era" manganese steel as the most satisfactory steel to resist the intensive wearing action to which such components are subject. In many cases the body is now made throughout of this special material, either as a solid casting or in the form of two cheeks, while considerable advances have been made in the size and weight to which such castings can be produced.

While similar developments have taken place in the dimensions and weight of top tumblers, the changes in these so far as design is concerned cannot perhaps be said to be so pronounced. They are still invariably six-sided, with the treads and flanges suitably protected by renewable "Era" manganese steel wearing plates. The bodies are generally of a suitable grade of Hadfield's best toughened cast steel, mounted on a forged steel shaft—in which connection Hadfield's method of fitting and the care and attention they observe in this operation can be relied upon to avoid any looseness—but in recent years a tendency has been shown on the part of some of the dredger engineers to adopt a type of tumbler in which the body and shaft are made as a solid casting, of which quite a large number have been supplied. Hadfields, however, are in a position to furnish both types, and with a reliability of construction and workmanship that can be guaranteed to avoid difficulties and give satisfaction.

Improvements in Other Accessories

It will be appreciated that a great deal could be said on this important subject. Improvements in gearing, ladder rollers, pin steels, screen plates, and the numerous other items in the way of steel castings and forgings that enter into the construction and are required for the maintenance of dredgers have all played their part in the development. Volumes could be written on the application of special steels to dredger work and the enormous advantages they are conferring on dredger engineers in making possible the smoother, more efficient, and economical working of their dredgers. Sufficient, however, has been said to indicate that Hadfields are well in the forefront of the development, and in co-operation with the dredger engineers, that the amount of study and research they have given to the various problems that arise has a very marked influence on the progress that is being made.

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*From the *British Trade Journal and Export World.*

Cement in Japan's Harbor Projects*

By Dr. TAKENOSUKE MIYAMOTO, Civil Engineering Bureau, Ministry of Home Affairs

Cement is one of the most important materials used in harbor construction and repair work. It is used as concrete or reinforced concrete. Construction of a harbor without cement is now inconceivable.

The harbor structures that require cement may be classified as follows:

To begin with, breakwaters in Japan are generally of rubble mound construction where the water is not deep and the wind and waves are weak. But in other places, concrete blocks or reinforced concrete caissons are employed in general. Especially where the water is deep and wind and waves strong can breakwaters be constructed with reinforced concrete caissons safely and economically. In this country, the breakwaters in the harbors of such places as Niigata and Yokkaichi are built of concrete blocks, while in those big harbors, such as Yokohama, Kobe and Osaka, are constructed with caissons. A structure like a breakwater has a huge dead weight and absolutely requires the monolith. In this respect, there is no better method of construction than by caissons. This system's merits are especially important in a country frequently visited by earthquakes, like Japan.

Next, such structures as quay walls, inclined wharves, revetments, etc., are generally built of concrete blocks, reinforced concrete caissons or specially shaped reinforced concrete walls.

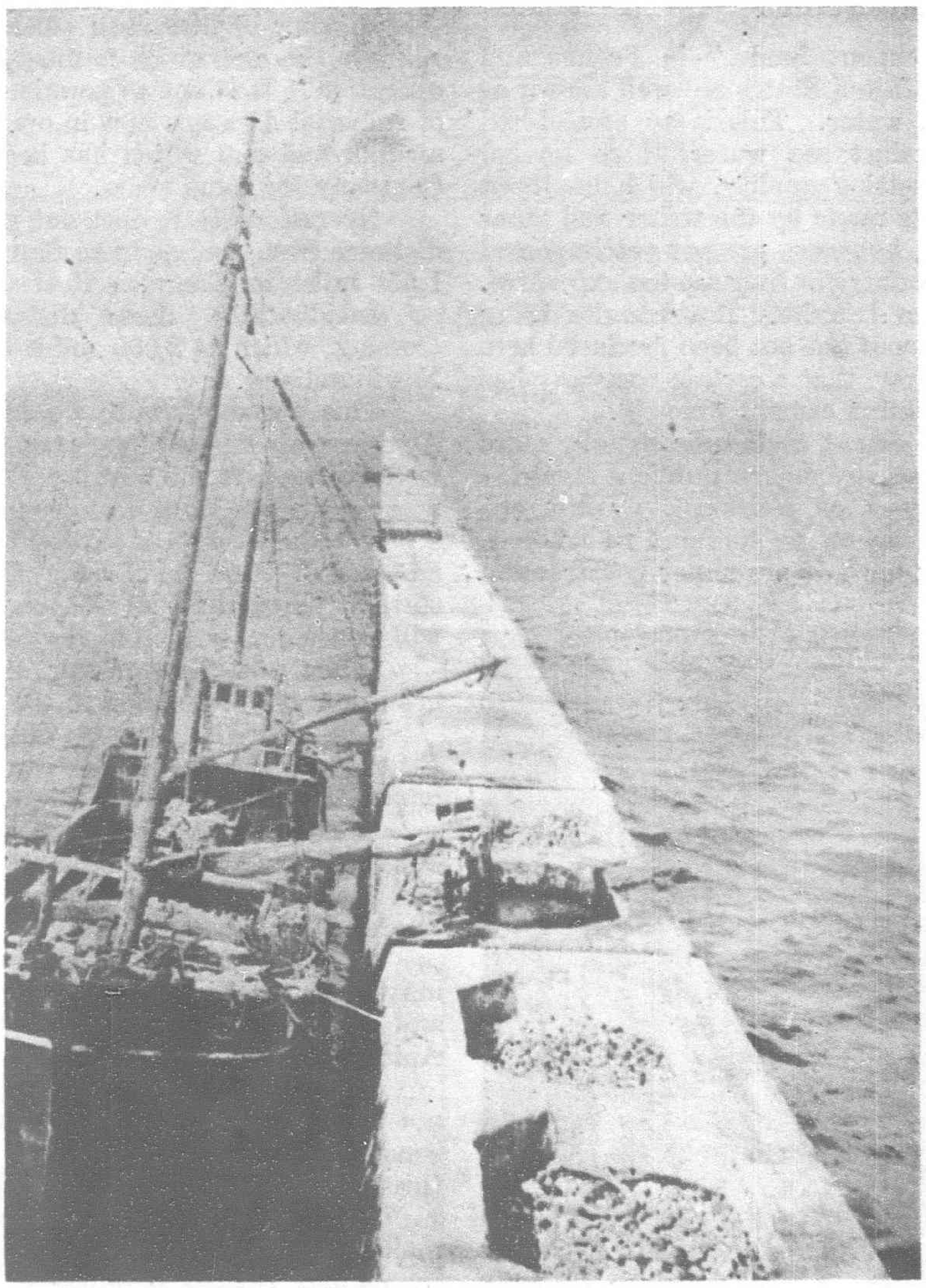
Quay walls in Japanese harbors having comparatively deep water are constructed, as a rule, with reinforced concrete caissons. Quay walls in the harbors of Yokohama, Kobe, Osaka, Rashin (Korea) and Dairen (Manchoukuo) are the most remarkable examples. In such an earthquake-stricken country as Japan, quay walls constructed with caissons are extremely unstable, and easily subject to damage by earthquakes. A striking example is afforded by the quay wall in the port of Shimizu which has been broken twice by earthquakes so far.

Stable Shore Bridges

More stable is a shore bridge built of reinforced concrete than one constructed with caissons. Shore bridges of this kind are already in service in this country at the harbors of Tsurumi, Osaka, Fushiki, etc.

Again, quay walls built with caissons are not suitable for harbors which have a feeble sea-bed. For example, the quay walls in the harbors of Osaka and Nagoya are of reinforced concrete, built in L-shape, resting upon steel sheet piles and pile foundations instead of caissons. Both are showing satisfactory results.

Speaking of landing piers, those in the harbors of Yokohama and Osaka were originally built of wood and steel combined. The former, however, was broken by the earthquake of 1923, while the latter collapsed in the typhoon of 1934. Both are or will be reconstructed of reinforced concrete.



Caisson block of the outer breakwater which was completed to fit the breakwater line

Besides these, such structures as floating piers, pontoons, sheds, warehouses, lighthouses, etc. are all built of reinforced concrete at present. And cement, in the form of concrete or reinforced concrete, constitutes one of the essential elements as a binding material.

Cement has come to be widely used in harbor construction mainly because of its following characteristics:

(*a*) It has a strong hydraulicity, (*b*) it may be moulded in any shape in the form of concrete, (*c*) it is free from the decomposition or corrosion which weakens wood or steel. Neither is it injured by sea weevils, hence it has a great durability. (*d*) Its price is comparatively moderate.

In harbor work, many structures are built in the sea as a rule, and therefore hydraulic materials have been required for this purpose since olden times. This is why a kind of hydraulic material has been used since the time of the Roman Empire. The hydraulic lime of to-day was invented by an English engineer called John Smeaton toward the end of 18th century. The fact that this invention was achieved when lighthouse No. 3 at Eddystone was rebuilt speaks for itself how closely the harbor work is connected with hydraulic materials.

Needless to say, the cement of to-day perfectly satisfies the requirements of high strength and high hydraulicity. In addition to these qualities, it possesses the quality of quick-setting and hardening which is far more important than hydraulicity, and for these reasons, cement is considered one of the most perfect hydraulic materials at present.

The cement produced in Japan especially has considerably improved in quality, and in its high early strength, Japanese cement far surpasses German and American. What is more, several kinds of special rapid-hardening cement are on the market, and are contributing much to the facilitation of construction work.

A Weighty Problem

The only defect cement shows when used in harbor work is that it disintegrates when attacked by sea water. To remove this defect, both manufacturers and engineers have racked their brains not a little for many years.

As to the cause of the disintegration of cement in sea water, Candlot, Le Chatelier, Michaelis and others who have made close studies for many years have found that what is attacked by the sea water is the free lime among the constituents of the cement. So it is believed that the most effective means of preventing disintegration is to produce some stable compound called calcium silicate by combining cement with free lime and adding to the compound some silicious admixtures.

As a result, it has been the practice in harbor work to admix cement with volcanic ash, diatom earth and white silicious earth,

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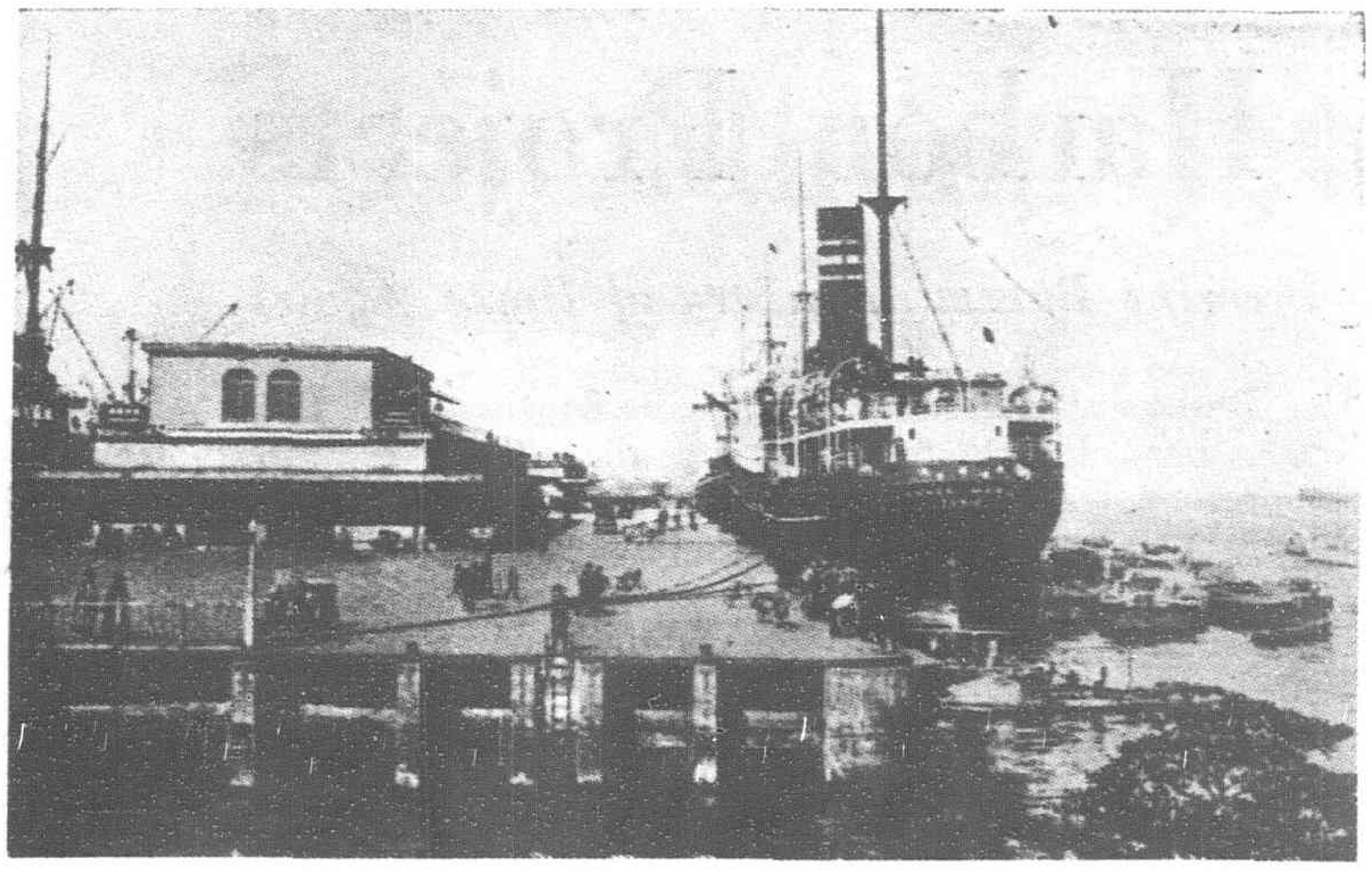
* In the *Japan Times*.



Landing stage and shed of pier at Yamashita-cho, Yokohama

etc., in ratio of less than 30 per cent. In Japan also this practice has been in vogue in the past. Of course, this may have some effects in relieving the disintegrating action of sea water, but it involves the defect, at the same time, of retarding the hardening and of causing, not infrequently, cracks in reinforced concrete structures. On this account, the present tendency is to prefer thoroughly tamped concrete of a specially rich mix instead of such admixtures for harbor construction. Thorough tamping and a rich mix greatly reduce the voids in concrete and prevent sea water from percolating, lessening the opportunity for disintegration to a large extent.

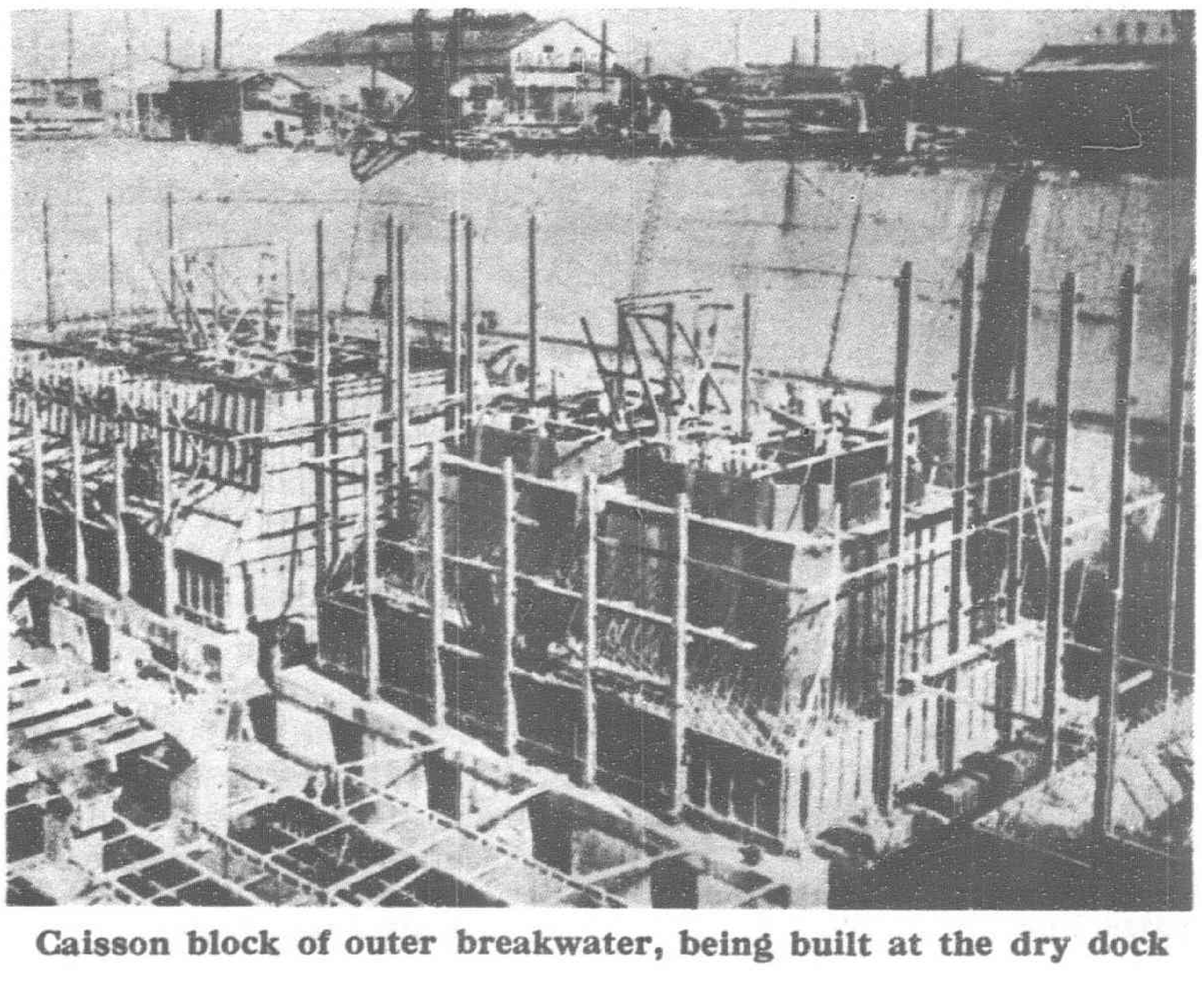
While the content of cement in one cubic meter of concrete is generally fixed at 300 kg., it is recommended that about 350 to 400 kg. should be contained in one cubic meter of concrete for works in the sea.

Sea Water Resistance

Such alumina cements as "ciment fondu" in France and "Atlas Luminite cement" in the United States are well known as the cements least affected by sea water. This is an established fact. Besides their resistance against sea water, these foreign cements have an excellent quick-setting quality, which has been fully coroborated by a series of tests made by the writer and other engineers. These kinds of cement, however, are not yet imported in appreciable quantities into this country as they are too expensive.

Alumina cement is made from bauxite. But bauxite being lacking in this country, alumina cement has not been produced here so far. It is worthy of note, however, that a certain company has started the test manufacture of alumina cement recently.

In view of the fact that this cement costs substantially more than ordinary portland cement, its use by general public is regarded as hardly possible. But its power of resistance against the disintegrating action of sea water can on no account be ignored. In Japan at present, about 20 big harbors are under construction or being extended, while small and medium-sized harbors under construction number approximately 60 in all. The cement used in this work amounts to about 140,000 tons every year, which represents about 2.7 per cent of the total produced in Japan.



Caisson block of outer breakwater, being built at the dry dock

Spanning the World with Air-Lines

(Continued from page 347)

first service flight at the end of October, in 1936, and since then a fleet of thirty similar aircraft, the biggest fleet of modern commercial flying-boats in the world, has extended the all-up mail scheme as far as New Zealand and South Africa.

Now it is announced that the all-up scheme will be extended to Hongkong, so that residents there will be able to dispatch a letter for 1½d. and it will be delivered in England within the week—a remarkable performance by any air-line, but even more important when it is realized that this is one of nearly 108,000,000 letters which Imperial Airways carries annually: the most important and by far the biggest air-mail scheme ever conceived.

The operation of the all-up mail scheme also brings closer the projected scheme for the extension of British air-routes across the Pacific.

Already the routes are under consideration. The first of them would be an extension of the Southampton-Hongkong service, up the coast of China to Japan, Vladivostok, across the North Pacific via the Aleutian Islands, to Alaska and British Columbia.

With the Canadian air service operating across North America and the Atlantic service on its way, the establishment of the Pacific routes would mean the complete girdling of the earth by British air-lines.

Already, there are signs of even further development, for when the Tasman service is in operation between Sydney and Auckland yet another link across the Pacific will be within sight. A second route is under consideration from Auckland to San Francisco.

In view of disturbed conditions in the Far East indeed, this route is the one which is most likely to be established for regular operation. It is not as populous as the great Empire trunk routes of Imperial Airways, now in operation, but it is an important world air-link and one which has been considered by this great British Company for some years.

Operationally it does not present very difficult problems, the distance from Auckland to Samoa being 1,800 miles, the next step 1,558 miles to Kingman Reef and another 1,000 miles to Hawaii.

Incidentally, these distances compare with the Atlantic crossing, which is 2,000 miles from Foynes, Eire, to Botwood, in Newfoundland.

This proposed route would connect, of course, with the Pan American air-line to Hongkong. The British line, when established, would operate to the west coast of the United States and then northward to British Columbia to connect with the trans-Canadian service.

Weather and radio experts have already collected a considerable amount of data on Pacific flying conditions, with observation stations particularly at Canton, Fanning, Christmas Islands, which will considerably help in the establishment of the Pacific services. When the Tasman air service is operating smoothly, full attention will be devoted to the proposed new lines.

The friendly dispute between the Governments of Great Britain and the United States, over the ownership of some of the important islands on the route, has now been settled amicably.

Great Britain also has other atolls which may prove major links in the Pacific air service, a view which is supported by the fact that the American route as at first outlined is probably to be altered in the near future.

It is suggested that Kingman Reef and Pago Pago (Samoa) may be abandoned in favor of Canton Island, in the Phœnix group, and Rose Island, the United States island about 200 miles from Apia (Samoa).

But, whatever the route in its final form, there should be in the not distant future two British trans-Pacific air trunk routes and a constantly developing service to the Far East from England through the already established India-Siam-Hongkong route.

It should not be long, therefore, before the globetrotter can make a leisurely circuit of the world in about a fortnight, entirely by regular British air-lines—a truly remarkable feat when it is considered that no other country in the world has such a system in contemplation.

Mine Timbering in the Philippines

By N. J. ERICSON, Consulting Engineer, in the Sugar News Supplement

THIS article upon mine supports or timbering is written primarily for the layman in order to give him a better understanding of the problems encountered and the expense involved in undertaking an undeground mining operation. The writer has been asked many times to explain the large expense involved in some mines especially in regard to mine supports. Some of the points involved will be explained herein to as great an extent as possible without becoming too technical or entering into too much detail.

It is best to start with a brief summary of rock types and their physical properties as an aid in understanding the main thesis of this article.

Rock masses can be most conveniently classified into five groups with the first group as the ideal situation and the last group as the most dangerous and the hardest to support. They follow:

First.—Solid Ground; composed of coherent particles with no planes of weakness. It may be crystalline or composed of irregular grains cemented together.

Second.—Heavy Ground; here the rock mass shows a series of parallel planes of weakness. Examples: sandstones, shales and sheeted igneous rocks.

Third.—Heavy Ground; here the rock mass shows two or more systems of planes of weakness. A rock mass of this nature is caving ground and is commonly met with in the Philippines due mainly to tropical weathering, fissuring, etc.

Fourth.—Loose Ground; here the rock mass may be composed of coarse and fine fragments or fine fragments alone. Examples: sand, fault breccias (crushed and broken rock), loose rock, etc.

Fifth.—Swelling Ground; here the rock mass is plastic or semi-plastic, due principally to the presence of water and to the proportion of clay present. This condition is also present in many mines of the Philippines.

The above will suffice for the purposes of this article; to go into the equilibrium of rock masses and the upsetting of this state of balance by mine workings would be superfluous here. The interested reader is referred to any good book on this subject, titles of which can be obtained from any engineer.

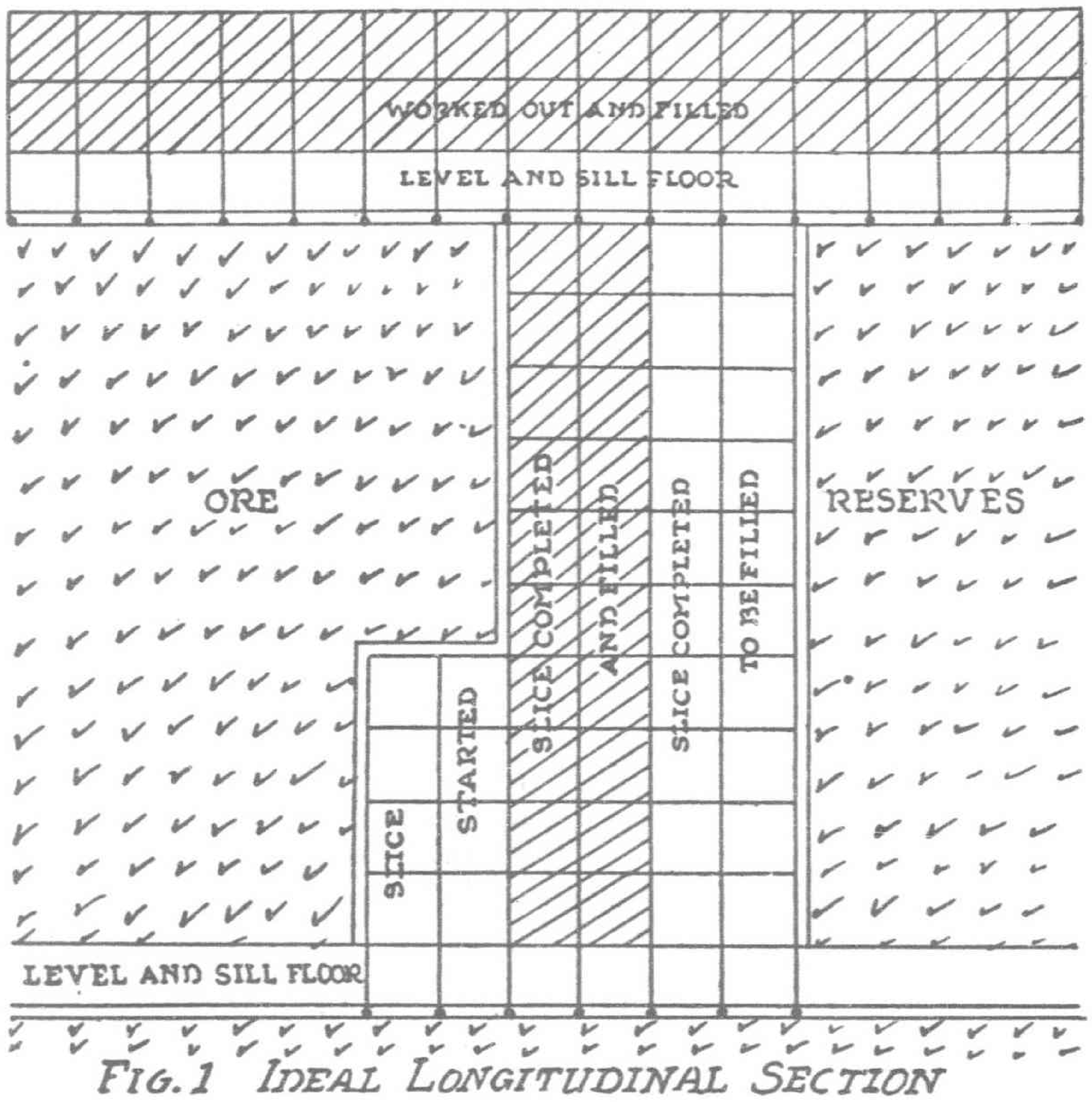


FIG. 1 IDEAL LONGITUDINAL SECTION

Watching Repair Bill

Timbering, pillars, steel mine structures, etc., are made use of in underground mines in order to keep the workings safe and open for operations for a usually limited period of time, if these structures fail before the workings are ready to be abandoned they must be replaced. Hence the problem is to keep this repair bill to a minimum, and to do this the strongest structure consistent with the use to which it is to be put, and with the period of time necessary to complete the work in any specific working is used. In the preceding classification, in general, the following may be taken to be true. Group I requires no support, Group II requires light support, Group III requires heavier support, Group IV requires heavy support and Group V requires excessively heavy support.

Mine workings comprise tunnels, drifts, cross-cuts, raises, shafts, shaft stations, pump chambers, stopes and rooms. To go into all of the various conventional structures for these workings is not the purpose of this article. To give some types of practice in the Philippines, especially those used in the Baguio area where, due to local conditions, some interesting problems have been met and solved, will be sufficient to give the reader an insight into the subject.

(Continued on page 362)

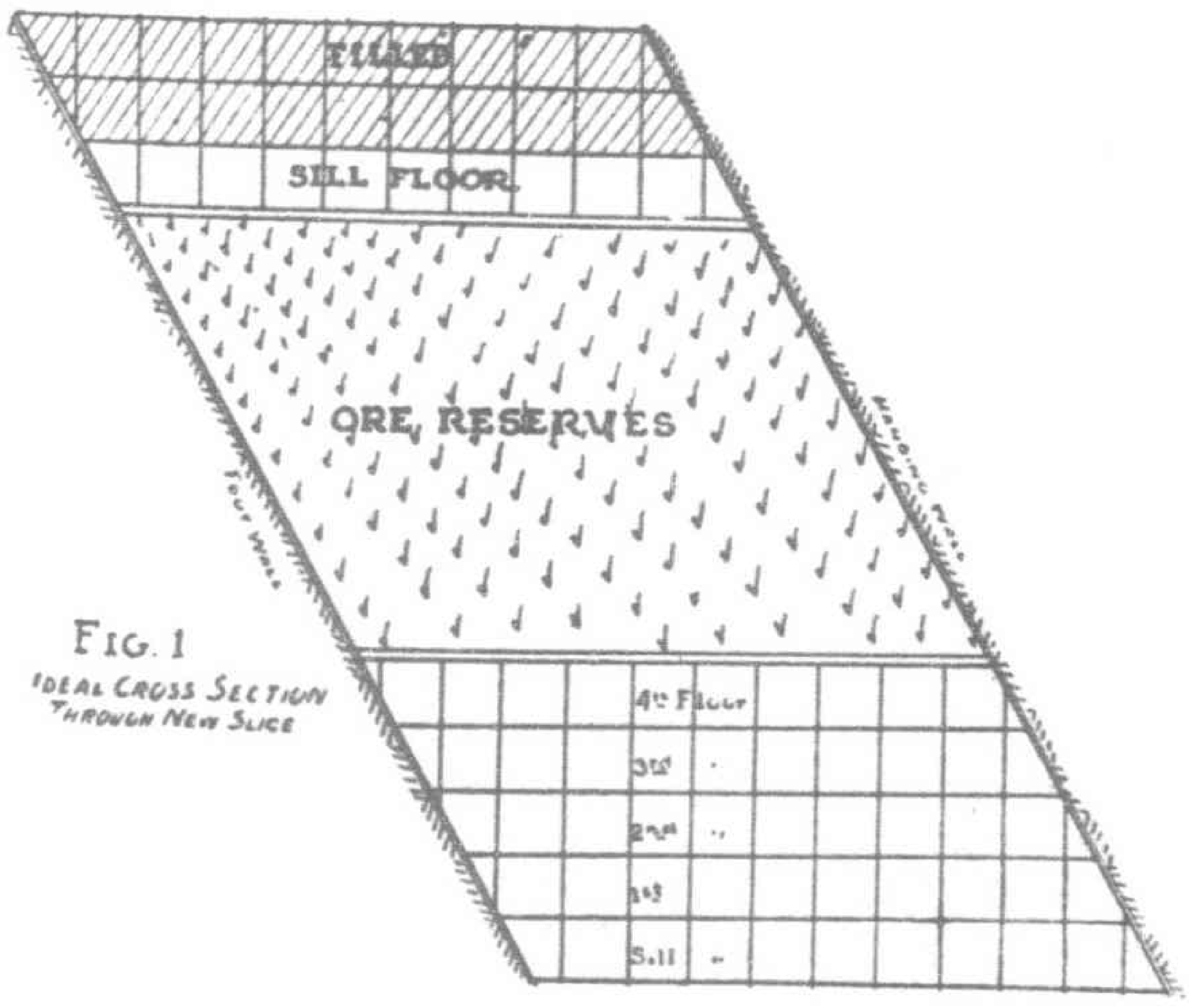


FIG. 1 IDEAL CROSS SECTION THROUGH NEW SLICE

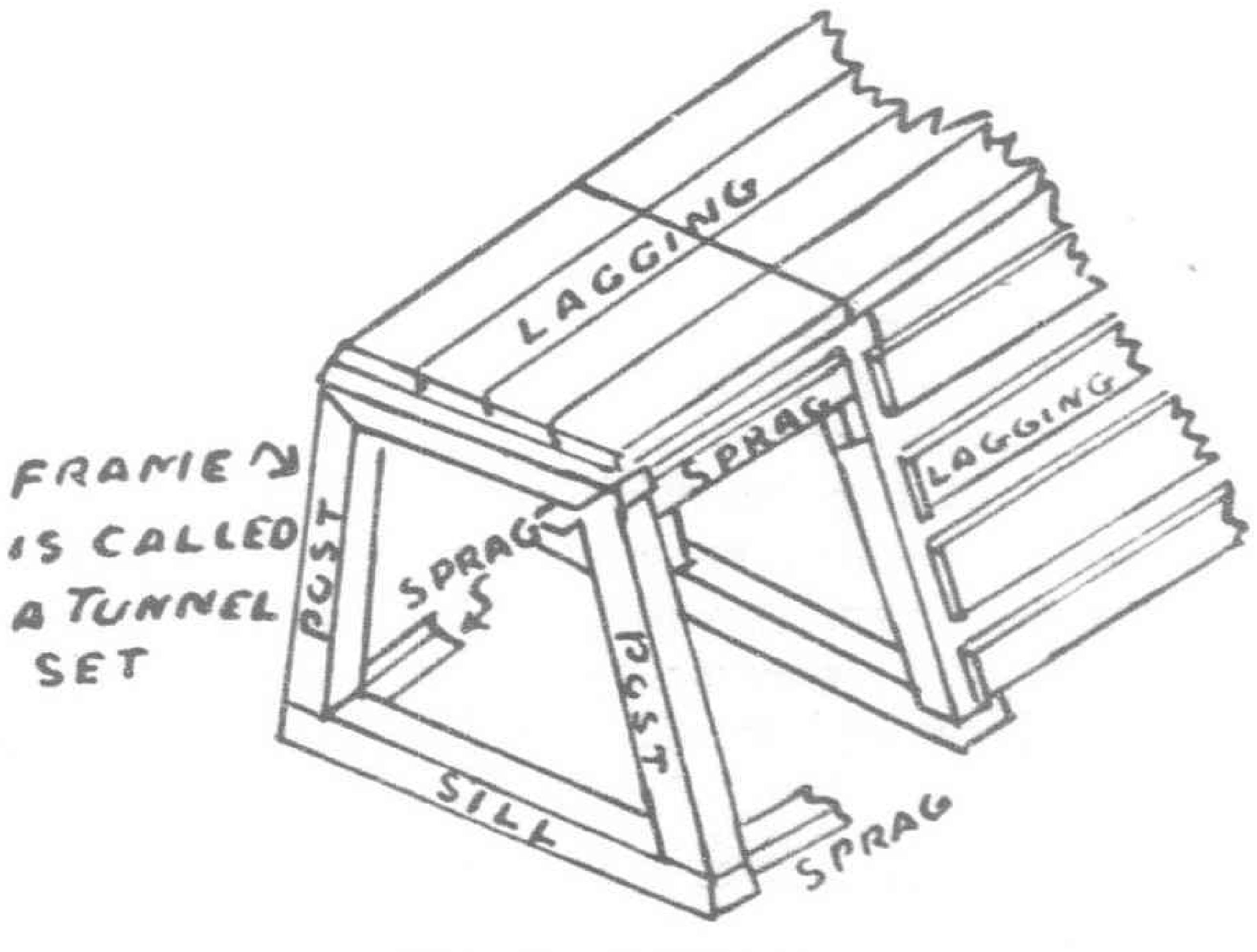


Fig. 2.—Drift set

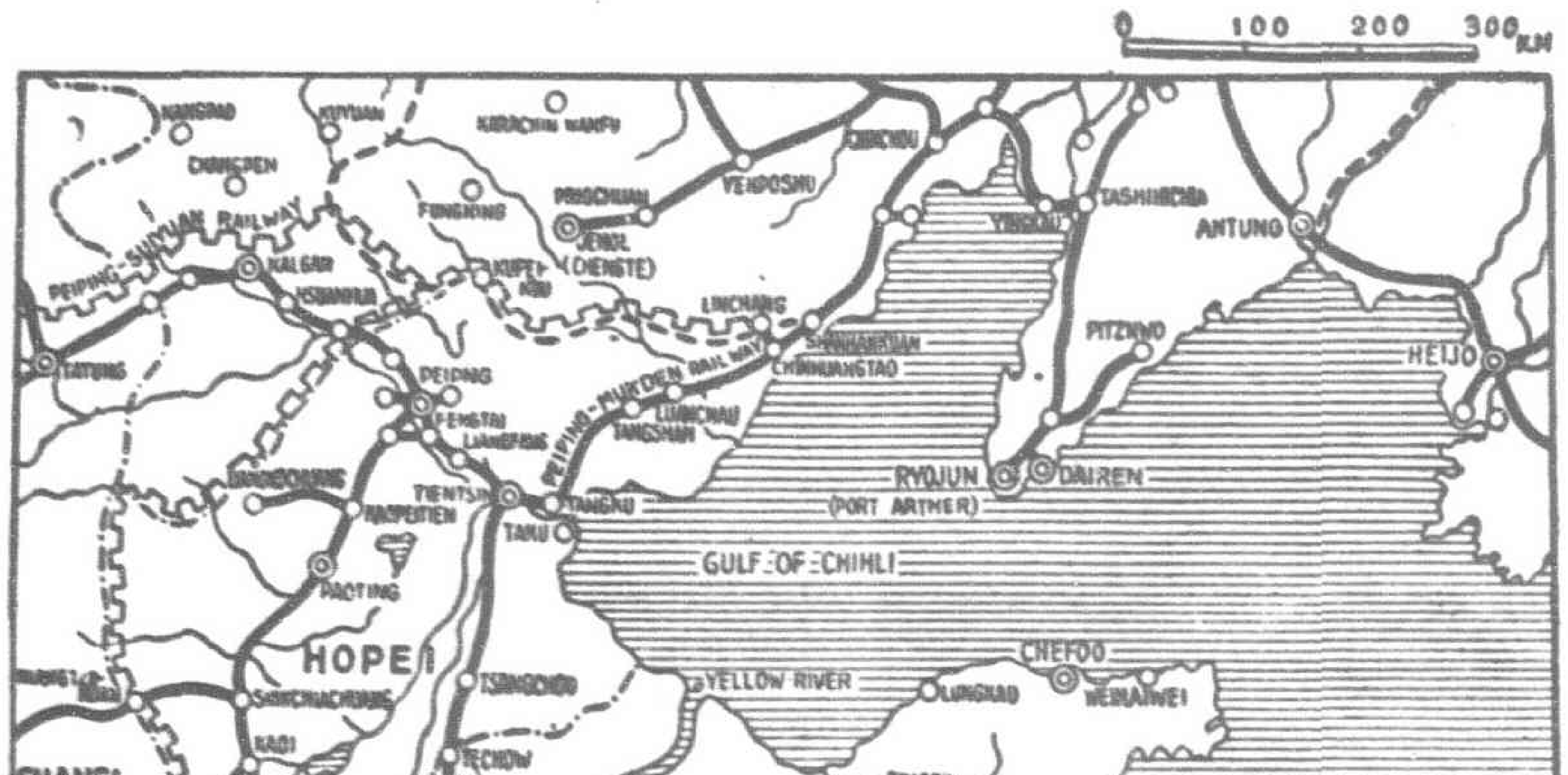
China's Hopei Rivers

By S. ELIASEN, life member of the Association of Chinese and American Engineers, in an article from the Association's Journal

In these times of neglected social conditions it may be useful to review briefly the peculiar river condition in the province of Hopei since it does not merely affect this province, but has a most vital bearing on the position and even existence of the city of Tientsin. An intelligent and effective control of the main rivers of Hopei is a *sine qua non* for the carrying on and development of normal trade. The vested interests in Tientsin alone can be counted in billions of dollars. Besides this city is by far the most important communication center in North China.

Yet, on account of a few neglected rivers which converge on it there is talk of sidetracking it as a port, seeking some dubious place elsewhere in the neighborhood to be developed as the chief northern harbor. Dr. Sun Yat-sen had such a plan and consequently it was included in the reconstruction program of the National Government. It was fully investigated in the beginning of the present decade and complete surveys were made of several places along the muddy shores north and south of Taku including the mouth of the Ta Ching Ho inside the Sha Lu Tien flats. The results were not such as to encourage the Chinese government to sink millions of dollars into a project which investigations showed was merely "on the verge of possibilities."

Now, just because the Taku Bar is not behaving quite as it should, the plan is again mooted. It is hard to find a more defeatist attitude. Running away from a problem does not solve it. There never has been made a really serious effort at coming to grips with the Hopei, or as it is commonly called, the Tientsin river problem. North of the Yellow River it is *the* North China river problem. Solving it means solving the North China harbor problem. Moving the harbor away from Tientsin and Taku solves nothing. It will merely make the situation in the north worse which again affects the vital issue at stake : the carrying on and development of trade.



Map showing the network of rivers in north and central China. Especially numerous are the streams in Hopei, and close to Tientsin

Moreover, the Hopei river problem is linked to the Yellow River problem. If the Hopei river problem is allowed to slide the Yellow River dangers will be made light of. But a flourishing Tientsin with its rivers in order will bring pressure to bear also on the Yellow River conservancy, and Hopei Province will be able to afford to contribute to the regulation of this river which, when accomplished, will mean enormously increased stability and prosperity to the whole of North China.

Dikes were Breached

Last year Hopei Province was ravaged by a flood in some respects almost equal in severity to the notorious floods of 1917 and 1934. Far more publicity would have been given to this flood had it not been for the war. Most of the plain between Paotingfu and Tientsin was under water. To save Tientsin from being flooded the Nan Yun Ho or Grand Canal dikes west of Tientsin were breached to let part of the water which had become impounded on the plain, and which was threatening to overwhelm Tientsin, escape to the sea southeastward and thus assist the Hai Ho in draining the inundated areas.

Even so the Hai Ho through Tientsin ran level with or higher than the bund, which had been sandbagged all along. It was indeed fortunate that the notorious Yung Ting Ho was not in flood at the same time. If that river had poured its silt masses into the Hai Ho at a time when it was already taxed to its full capacity and seriously silted it, a major disaster for Tientsin might have taken place. Since the Yung Ting Ho floods have not yet been harnessed this could easily have happened in that the regulation works north of Peitsang could have been outflanked and the whole silt-laden flow emptied into the Pei Yung Ho below the works.

At the expense of the population in an inundated area of more than 2,000 square miles, Tientsin finally became the gainer in that the Hai Ho which had been seriously shoaled and narrowed since 1927 again became deep and wide. Some trouble still exists at the Taku Bar, but this will undoubtedly be rectified by dredging this spring, and in a short while Tientsin will again see the larger coast steamers at her bund. In fact they are arriving already.

Last year's flood came unusually late. The mountain streams which caused the inundation had been in freshets late in August and the beginning of September. But, as is usual, the accumulation of water near Tientsin first reached its crest a month later. Information of the flow of the mountain streams, which was obtained afterwards, shows that it was mainly the Ta Ching Ho and the Tzu Ya Ho which were the trouble makers this time. These streams drain the mountain areas west of the Peiping-Hankow railway between Liang Hsiang Hsien in the north and Chang Te Fu in the south. Some have their headwaters in Shansi Province. Immediately east of the railway they overflow their banks when in flood and the water spreads over the plain.

The flow of the southern tributaries gradually collects in a low ponding area near Hsien Hsien in the center of the plain and through the diked Tzu Ya Ho drains off north towards Tientsin, while the flow of the northern tributaries collects in the low areas east of Paotingfu and slowly the water masses find their way eastward across the plain to join up with the discharge of the Tzu

Ya Ho. Through the twenty-mile length of the Hsi Ho which is diked along the south bank and flanked by the high alluvial ridge of the Yung Ting Ho to the north the floodwater is drained off into the Hai Ho and thence to the sea.

Drainage is Needed

Since the Hai Ho is not able to convey a flow much in excess of 1,000 cu.m. per sec. without overtopping its south dike, while the combined discharge of the mountain tributaries may exceed 50,000 cu.m. per sec., it follows that the plain acts as an enormous flood-control detention basin storing at times more than 5,000 million cubic meters of water which during the autumn months and the winter slowly drains off. It is evident that increased drainage facilities for this huge quantity of water is an urgent and humanitarian necessity in order to alleviate the suffering of the several million people living on the plain west of Tientsin and also to safeguard Tientsin itself from the danger of becoming inundated.

The mountain tributaries of the Ta Ching Ho and the Tzu Ya Ho are all more or less silt-laden streams while in freshets during the summer. For the rest of the year they carry little water and silt and many of them even run dry shortly after the freshets are over. When one of the periodic inundations occurs practically all the silt they carry settles in the inundated areas not far to the east of the Peiping-Hankow railway, and the floodwater which is drained off through the Hsi Ho and the Hai Ho is almost clear. This has an excellent effect in scouring out the silt deposits which have shoaled the Hai Ho in periods between major inundations. In fact the Hai Ho owes its existence as a navigable river to these periodic inundations. In years of smaller flow when there is no inundation some silt may find its way along the channels directly to the Hai Ho. The silt is of a fine variety, is readily kept in suspension, and it is rare when it is of sufficient quantity to do material harm to it. If continued observations should show that it will be desirable to prevent such silt from entering the Hai Ho, settling basins for it can be found on the plain without too great a cost or too much trouble.

The Nan Yun Ho or Grand Canal which flows into the Hai Ho less than a mile away from the point where the Hsi Ho enters it is of far less importance. Its flow cannot exceed 200 cu.m. per sec. and its silt is of an exceedingly fine character which shows little tendency to settle in the Hai Ho. However, there are periods in which it is desirable to exclude it, and it will not be difficult or expensive to arrange for this by upstream regulating works whereby the full flow for some days can be sent to sea via one of the several defluent channels which already exist.

The main drawback of the Nan Yun Ho lies in the fact that it forms an alluvial ridge of its own making which flanks the eastern edge of the plain. This makes it difficult to arrange for a good drainage scheme of the southern Hopei rivers such as those which converge to form the Tzu Ya Ho, 100 miles south of Tientsin. To take the flood drainage to sea in a separate channel by letting this cross the Nan Yun Ho is an expensive undertaking if it is to be satisfactorily done.

The third tributary which goes to make up the Hai Ho is the Pei Yun Ho from the north. It is separated from the Hai Ho by the high, alluvial ridge of the Yung Ting Ho which enters the Pei Yun Ho ten miles north of Tientsin. Since the Yung Ting Ho drains extensive, easily eroded loess areas in southern Chahar and northern Shansi and is diked from the point where it leaves the mountains near Peiping it carries the excessive silt load it contains when in freshets directly into the Pei Yun Ho and the Hai Ho. Much of the silt is coarse and settles quickly in the flat sloping, tidal Hai Ho. It is generally when the freshets are not too excessive that the Yung Ting Ho can be most destructive to the Hai Ho, and the Palliative Scheme is now in operation to prevent this. When major freshets occur its dikes break at some place upstream and the flow with the silt goes out on the plain where the silt settles and the more or less clarified flow finds its way to the Hai Ho either via the Hsi Ho or at some upstream point on the Pei Yun Ho, accompanied, of course, by much destruction of villages on the plain.

Broke Loose Once

Apart from the Yung Ting Ho the Pei Yun Ho itself is a flood and silt carrier of major proportions. At one time it was regarded as a clear-water river, beneficial to the Hai Ho. This is not always the case, however. Measurements taken of it where it enters the plain 25 miles north-east of Peiping show that it can be heavily silt-laden when in freshets. In 1913, instead of flowing south to Tientsin, it broke through toward the east during a serious flood, and via the Chien Nan Ho and the Chi Yun Ho entered the Chihli Gulf at Peitang, ten miles north of the mouth of the Hai Ho. Efforts were made to bring it back, but failed, however. After some years of hydraulic study and surveys of the whole plain north of Tientsin by the Chihli River Commission, it was decided to construct control sluices at Su Chuang, fifteen miles east of Tungchow, in order to make it possible to send the flow, as desired, either via the old channel to Tientsin or via the new channel opened up in 1913.

These works were completed in 1925 and, when correctly operated, have proved a great boon to the Hsi Ho and Tientsin both from a silt and flood-control point of view. The flood-relief channel to the east, the Ching Lung Wan Ho, which takes off from the old channel of the Pei Yun Ho 45 miles north of Tientsin was also improved in 1925, but requires further attention mainly in its lower reaches.

Before the control sluices were built at Su Chuang one of the flood-control measures for the Pei Yun Ho, in common with several other Hopei rivers, was the allowing of a part of the flood flow to escape west out onto the plain a short distance upstream of the headworks of the Ching Lung Wan Ho defluent. Remnants of the old control weir are here still visible. The escaped water flooded the plain extensively where the present Peiping-Tientsin railway runs and re-entered the Pei Yun Ho below Yangtsun, being guided into it by the alluvial ridge of the Yung Ting Ho. Such a flood-control scheme, still practiced on some of the other Hopei rivers to-day, is of course a very desperate measure and can scarcely be called hydraulic engineering, as it is too destructive. The Su Chuang control sluices now make this unnecessary on the Pei Yun Ho ; but further improvements are needed along the new channel which this river formed in 1913 in order to make the northern plain safe from floods.

An exhaustive study of its mountain tributaries should be made to find out the possibilities for detention-basin flood control within the mountains in order to lessen the necessity for a large capacity flood channel along the route of the 1913 flood channel. Due to the flat-sloping plain, the inflowing tributaries and the silt in the flood flow, it is highly expensive to operate a large capacity flood channel since it needs much attention.

As far as the Pei Yun Ho is concerned the position of Tientsin and the Hai Ho is fairly satisfactory ; but as regards the population living along the new 1913 flood channel it is far from satisfactory. For the prosperous development of Tientsin its hinterland requires its full amount of consideration. It is not enough merely to consider the navigability of the Hai Ho and the safeguarding of Tientsin from floods.

Yung Ting Ho Ignored

Some remarks have already been made regarding the Yung Ting Ho. Rightly it has been nicknamed " the Little Huang Ho." Much " paper attention " has been given to it ; but very little real attention. Until it is harnessed it will hang as a Damocles' sword over Tientsin and the Hai Ho. A river which transports annually an average of 30,000,000 cubic meters of silt from the loess areas in the mountain regions and deposits this on the plain around Tientsin and in the Hai Ho is not to be trifled with. Yet the condition is such that a well-thought-out control plan for it will bring highly beneficial results as witnessed by the so-called Palliative Scheme which came into being six years ago. By regulating works located fifteen miles north of Tientsin it has been made possible to sluice a good portion of its silt onto the low areas immediately east of the Pei Yun Ho and thus prevent the Hai Ho from becoming silted.

But these low areas are rapidly being filled up and in less than ten years from now trouble will be experienced with conveying the silt through the channel which connects the control works and the deposition areas. This will mean that the control works at any time after can be outflanked and the silt masses will again pour into the Hai Ho. This is not painting the picture too dark. The writer has had too long experience with the silt-laden North China rivers not to know the tricks they can be up to. Now is the time to prepare for additional silt-control measures so that a smooth change over can be made at once when the present works show signs of having outlived their usefulness. One is up against a rapid geological land transformation and any plan based on controlling the deposition end in this transformation must necessarily be of a temporary nature. But correctly handled it can be brought to good account.

The land in the present silt-settling basin, which before the works were built cost at the most $5 per *mu*, cannot now be bought for $20. When the filling is complete most likely it will be worth $50 per *mu* due to its proximity to Tientsin and the fact that it will be above flood level when an inundation of the plain occurs. This difference in land price is double the cost of the original control works. But to arrange for new settling basins takes time. The present works were planned in 1928. It took four years before they could be put into operation mainly on account of long, protracted negotiations with the local population, in spite of the fact that the settling basin was a low-lying swamp, rarely cultivated which obviously would benefit by being reclaimed. The technical difficulties to be overcome were also light. How much more time will not be needed when more difficult situations have to be met ?

In its " Final Report and Grand Scheme " issued in 1925 by the Chihli River Commission it was proposed to have a large silt deposition basin for the Yung Ting Ho to the south of it, 40 to 50 miles west of Tientsin. The more or less clarified defluent from this basin would discharge into the Ta Ching Ho or the Hsi Ho. The area would be large enough to last for more than 100 years and the filling up of it would not interfere with the drainage of the Ta Ching Ho or the Tzu Ya Ho. The North China River Commission has prepared plans for a similar scheme by utilizing progressively smaller areas adjacent to the north dike of the Yung Ting Ho more upstream. Both schemes have their merits and ought to be discussed as soon as possible by a competent board of engineers familiar with the situation in order to get action. Other solutions should be looked into and a definite choice made as to the most practicable plan. At present the situation is drifting and the public has a right to demand that its interests be looked after.

Mention was made that any plan which is based on controlling the deposition end of the geological land transformation of the Yung Ting Ho can only be of a temporary nature. Obviously a more permanent solution can be had if it proves possible to control the soil erosion in the mountain areas from which the silt comes. The writer firmly believes that this is possible if energetically undertaken. But it will take time ; and before anti-soil erosion measures will become effective it is necessary to have silt-control work in the plain.

The Japanese Plan

Recently Japanese engineers have proposed to build a dam 100 meters high across the Yung Ting Ho gorge in Huailai Hsien for developing hydro-electric energy, it being desired to develop 150,000 kw. This would at the same time store at least 90 per cent of the Yung Ting Ho silt. But the drawback is that the storage would become exhausted in about 30 years in that the whole reservoir would be filled with silt and, as far as Tientsin and the Hai Ho are concerned, the situation would revert to that which existed before the dam was built. The electric energy output would dwindle to an irregular supply varying from almost nothing to a maximum of less than 20,000 kw.

In the summer the plant would often have to be shut down on account of the high silt content in the flow. And not only that. The dam would have far-reaching effects upstream in that the whole regimen of the river would be lifted up 100 meters at the dam, and then, by silt deposition upstream, rapidly re-establish its slope backwards, an action which would be felt perhaps as far as to Kalgan, burying in silt villages, agricultural land, roads, railways; mines and making untenable present human activities in the Huailai-Hsuanhua Fu Valley. This valley, except near the entrance to the gorge where the dam would be, is narrow and the deposition would proceed at a paid rate. What the final result would be is impossible to foretell. This proposed storage basin in Huailai Hsien is the most downstream of several which are to be found on the Yung Ting Ho drainage area. It should be reserved as a self-scouring flood-control detention basin. Other areas more upstream ought to be utilized for silt retention if the conditions are favorable. This can be regarded as an axiom.

The Chihli River Commission and its successor, the North China River Commission, had such plans, but they have scarcely reached beyond the planning stage. Some silt-retention works in the mountain areas had been started by the North China River Commission prior to the present upset conditions ; but it is not known to the writer how far they had been advanced. Its engineers were able men who have had long experience with the Yung Ting Ho and one may rest assured that their plans had a sound basis. It is a great pity that their work has come to a stop.

Flood control and silt control of the Yung Ting Ho are more urgent than trying to utilize the stream for electric development, and unfortunately the condition is such that the two projects do not harmonize. But a modest hydro-electric project may become feasible on the lower Yung Ting Ho gorge near Peiping after flood and silt control measures have been successfully carried out on the upper river. What would seem a more logical project, however, would be to have a central coal-burning generating plant located close to one of the many coal mines which are to be found in the Yung Ting Ho Valley.

It is not intended in this article to touch upon the regulation of the Yung Ting Ho course from the mountains to where it enters the Pei Yun Ho. Attention will only be drawn to the two flood defluent channels it has at Lu Kuo Chiao and Chin Men Chan which at times may discharge as much as 1,500 to 1,600 cu.m. per sec. into the Ta Ching Ho and hence to the Hsi Ho and the Hai Ho. Some silt can find its way to the Hai Ho via this route, depending, however, much on whether or not there is a general inundation of the plain west of Tientsin. In case this is severe the silt settles before reaching the Hai Ho.

River's Slope Steep

Also during periods when the Yung Ting Ho breaks its dikes there may be a sudden influx of silt into the Hai Ho, especially if the breaks are located in the lower reaches of its diked course. Usually the silt influx comes to a stop after a few days due to the increased depth of the inundation which follows and which causes the silt to be deposited on the plain west or north of Tientsin. The so-called Yung Ting Ho delta north-west of Tientsin which has been a silt deposition area for the last 200 years is still partly serviceable. But the river's slope through it is now so steep that it can be regarded more as a part of the diked river course. Trouble has already been experienced with holding the river within this delta so that it does not outflank the regulation works for the Palliative Scheme.

New dikes in the delta have been built and other dikes much heightened and strengthened recently in order to avoid this.* As the eastern end of the delta reaches the outskirts of Tientsin and the delta itself is elevated above the plain and every year becomes more elevated the situation is not a comfortable one and the utmost vigilance is required to keep the dikes intact and above flood level.

The writer would draw the attention to the possibility of passing the Yung Ting Ho on a broad aquaduct over the Pei Yun Ho, a semi-syphon arrangement, whereby the Yung Ting Ho could be allowed to build up its slope eastward. Much larger areas for silt settling could then be reached east of the Pei Yun Ho. Planned on a sufficiently comprehensive scale such an arrangement would not interfere with the drainage of the plain west of the Pei Yun Ho nor with the latter river. Such interference is a great drawback to the present Palliative Scheme. But an aquaduct crossing can first be made after the delta and the plain east of the Pei Yun Ho have been built up higher than they are at present.

In conclusion a few words may be said regarding the drainage of the plain west of Tientsin. Last year it was found necessary to breach the Nan Yun Ho dikes letting a part of the floodwater find a way to the sea south of Tientsin in order to save this city from being flooded. If an escape channel from the point of breach to the sea had existed such a desperate measure would not have been necessary and an area of 500 square miles supporting a population of over 100,000 people could have been saved from inundation, much loss and misery. Such a channel has been strongly advocated since 1924 and was incorporated in the Grand Scheme of the Chihli River Commission. If it had existed the inundation of the plain west of Tientsin would never have reached such damaging proportions as it did since the channel would have started functioning right from the beginning of the flood period.

It is obvious that the flood channel would have to be of large size and capacity, discharging under maximum flood conditions not

(*Continued on page 355*)

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*Refer to " Accomplishment of the Hai Ho Diversion Works in 1936 " by C. Y. Kao, *Journal of the Association of Chinese and American Engineers* for January-February, 1937.

Developments in New Guinea

Although with the march of man and of the machine New Guinea's glamour as the only undiscovered country on earth is rapidly passing, it still looms warmly romantic on the Pacific horizon. East of the 141st meridian it is British territory, administered by the Government of the Commonwealth ; and both Papua, the southern portion, and the northern mainland, which makes up the greater part of the Mandated Territory, have contributed of late to the quickening of human imagination.

Papua, which has been British since 1883 and an Australian territory since 1901, burst afresh upon the vision of the world two years ago when Mr. Jack Hides, a field officer, returned from wild country in the north with maps of new mountains and valleys and stories of a new race of people. Other patrols have since opened new country around the Fly and Strickland Rivers to the west, and the Purari to the east. North of the Papuan border, in the Mandated Territory, aeroplanes have been opening up country for mining and agriculture with a rapidity scarcely paralleled in history. Now over half a million more people have been brought into the world's census, and anthropologists can meet once murderous natives on friendly terms and have marked new mountains and new rivers upon their charts.

New Britain

New Britain, largest and most settled of the 600 islands, large and small, which, with the north-east mainland, make up the Mandated Territory, came into the news when beautiful Blanche Bay, on which stands the capital, Rabaul, became a sea of terror on May 31, 1937. A crater suddenly formed on an island named Baluan, close to the shore, and erupted flame, smoke, pumice, and sulphur, accompanied by almost continuous earthquakes. Matupi, a crater near the town and to the east of it, added to the horror. The inhabitants escaped by schooner and steamer to Kokopo, the next town, with the loss of only two European lives. Far away hundreds of natives perished when roads were blocked and villages buried beneath the pumice. Within a week, however, all was peace again, and Rabaul is now reoccupied, but only temporarily, for the Commonwealth Government has decided to move the capital to another site yet to be chosen.

The Mandated Territory also occupies the political stage. The question has arisen whether it should be given back to the Germans, who colonized it till the Australian naval and military forces took it from them in September, 1914. Australia has had the Territory under mandate since 1921, and there is little doubt that Australian public opinion is behind the Minister for External Affairs (Sir George Pearce) when he declares that the Commonwealth will never sanction its return. Australians have regarded New Guinea as theirs ever since the Australian Colonies jointly requested its annexation in the early eighties, influenced by fears that foreign Powers would forestall Great Britain there and establish either penal settlements, such as those whereby Great Britain had herself wrought harm in the South Seas, or menacing outposts, stepping stones across the Pacific to the very threshold of the Australian continent. Since 1914 goldfields and rich plantations have come into being, in addition to the copra areas developed by the Germans before 1914; and the Australian population has enormously increased, particularly on the mainland, where the port of Salamaua has grown from nothing, and a few miles away the airport of Lae is the only approach to the goldfields of Wau and Bulolo, which have neither road nor railway. There is little likelihood of an asset so valuable, held with such energy and industry, being lightly surrendered.

Of a total area of 93,000 square miles in the Mandated Territory 33,540 square miles were under control of the Administration on June 30, 1936, and 15,740 square miles were under its influence or partial influence. The enumerated native population at that date was 500,040, inclusive of 36,000 indentured laborers. Over 60,000 natives were attending mission schools. The Territory had a favorable trade balance of some £1,283,000, its imports being valued at £1,290,000, as against exports to the value of £2,573,000. Of its exports gold accounted for as large a share as £1,704,498. Copra to the value of £761,000 was the next most important item, and then desiccated coconut to the value of £65,000.

The coconut palm is still the basis of agricultural exports, but a beginning has been made with the export of coffee and peanuts to Australia ; cocoa and kapok are also being grown on a small scale, and experiments are being made in the production of rice. The year ended with a Government surplus of £40,000, and the Administration reported that of a revenue of £419,000 some £138,000 had been spent on the welfare of the natives.

Papua's chief exports were copra to the value of £100,000, gold (£81,000), rubber (£89,000), desiccated coconut (£42,000), and trochus shell (£13,000). The exports of the territory were valued at £355,000, against imports of £317,000. Ten years ago Papua had a trade valued at £1,000,000, but that was when the price of copra was very high and the copper mines were still producing. Coffee and rice are produced on a small scale and an infant industry is the production of paper pulp from native grass. With a revenue of £166,000 and expenditure of £165,800, the territory produced a small surplus. Over 14,000 natives are employed by the European population of some 1,200.

Nauru and Norfolk Island

Nauru, or Pleasant Island, another Pacific territory, is administered jointly with the Unitd Kingdom and New Zealand. It, too, was taken from Germany in 1914. It is noted for its guano deposits. Up to 1885, when it was annexed by Germany, it was notorious as one of the most terrible graveyards of shipping in the Western Pacific.

Also a territory of Australia is Norfolk Island, once an island hell for convicts, to-day very nearly an island paradise. For some reason it interested Great Britain in the eighteenth century more than any other land in the Pacific. As early as 1785 a syndicate was formed to exploit the island, which had been discovered by Captain Cook in 1774. In 1788 it became a penal station and in 1856, when the convicts were withdrawn, it became the home of the mutineers of the Bounty and their descendants, who had outgrown Pitcairn Island. To-day it is rich in temperate and tropic fruits and is growing in favor as an Australian holiday resort.

China's Hopei Rivers

(Continued from page 354)

less than 2,000 cu.m. per sec. It should not be made to discharge into the lower Hai Ho as this would be to the disadvantage of both channels, but made to empty into the sea well to the south of the mouth of the Hai Ho. This would mean crossing the Machang defluent either by a level crossing or by a syphon arrangement, whichever would seem the most practicable and economical. It need not be excavated right to the sea, but the excavation stopped about ten miles from the actual sea coast letting the flow spread out over the low uninhabited land near the sea coast and find its own way to the sea. There is both slope enough and discharge enough to accomplish this. Much money could be saved in this way as the excavation would be costly due to the large channel section required. Since there would be very little silt in the water the land near the coast would undergo no material change, and being in use only a couple of times each decade there would be little chance for any definite tidal channel to develop which might have any deterimental influence on the condition of the Hai Ho. On the contrary it is to be expected that the new channel mouth would silt up during periods of usage, a thing of no consequence to its efficiency as a flood defluent.

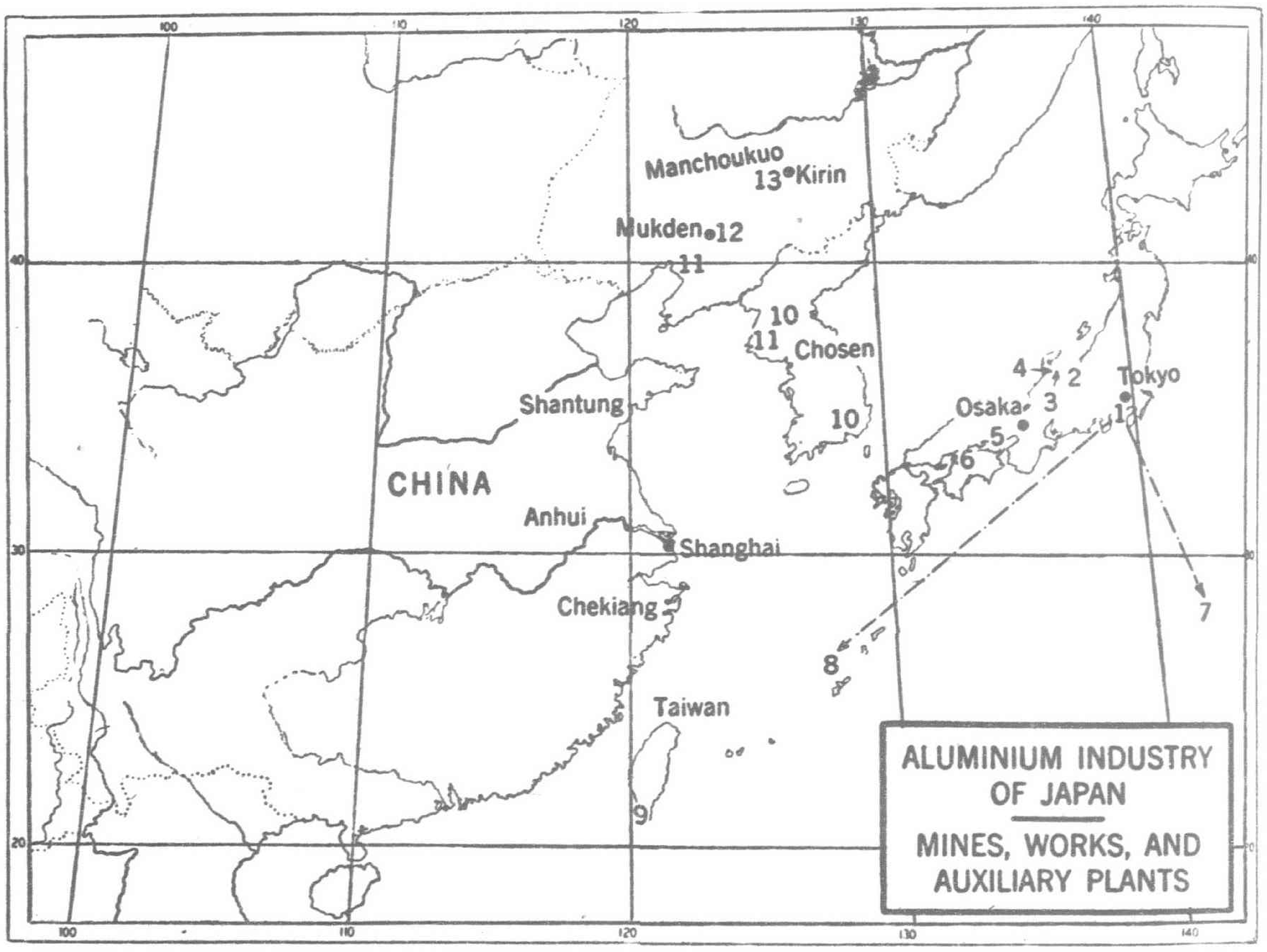
Japan's Aluminium Industry

By ROBERT J. ANDERSON, D.Sc., in the Mining Magazine

The general aluminium industry of Japan has expanded markedly in the course of the last 15 years and recent developments there have attracted much interest in foreign metal circles. Production of primary aluminium was begun in 1934, when the output was about 700 metric tons, made by one company. In 1937 the total out-turn was 10,500 metric tons, produced by five companies. The output in 1938 has been forecast in Japanese publications at about 30,000 tons, but it seems unlikely that this will be attained. However, ambitious plans have been drawn up by the present producers for increasing capacity and new reduction works are being built or have been projected by a number of additional companies established within the last two years. The indications are that the home output of primary aluminium by 1939 may be sufficient to cover Japanese consumption. Considerable quantities in excess of domestic requirements may later be produced with the view to export, mostly in the form of finished goods and semi-manufactures.

Although the primary aluminium industry in Japan is of quite recent origin an important working-up branch had previously been developed. Certain utensils and other light wares were made in Osaka and Tokyo as early as 40 years ago, but the manufacturing industry grew slowly up to the start of the War. It began to expand substantially about that time and since 1920 the growth has been rapid. Raw material for the fabricating branch was imported from various producing countries. Imports of primary aluminium ingot rose from 2,012 metric tons in 1920, to 4,651 tons in 1925, and to 11,893 tons in 1929. Owing to the increase of consumption the question of producing aluminium in Japan was revived. Investigations of the problem were made during this period by leading industrial interests and also by several research institutes under Government support. It was finally concluded at the time that home production by private companies would not be feasible unless subsidized.

Several attempts were made before 1921 by Japanese companies to produce aluminium on an industrial scale, but the enterprises were short-lived. The first undertaking was called the Japan Aluminium Industrial Co., Ltd. (Nippon Keigin Seizo K.K.). It was founded in 1916 and capitalized at one million yen. This company tried to exploit a process of Y. Takejima for the extraction of aluminium from clay, a plant being established at Yata, a suburb of Nagoya. Only a small amount of very impure aluminium was produced experimentally and work was stopped in 1917. Then the Osaka Zinc Mining Co., Ltd., bought the Japan Aluminium Industrial. Some alumina was made at the original Nagoya plant by the former concern and experimental electrolysis was carried out at its Torishima works in Osaka. In 1918 operations were transferred to a new plant at Omachi, Nagano Prefecture, but this was soon closed. The total amount of aluminium produced by the Osaka Zinc Mining Co., Ltd., was only about ten tons.



Map showing locations of Reduction Works, Auxiliary Plants, and Ore Sources of the Japanese Aluminium Industry.—Key : (1) Yokohama plant of the Japan Electro-Chemical Co., Ltd. ; (2) Omachi works of the Japan Electro-Chemical Co., Ltd. ; (3) Higashi-Iwase works of the Japan-Manchuria Aluminium Co., Ltd. ; (4) Takaoka works of the Japan Soda Co., Ltd. ; (5) Shikama plant of the Shikama Chemical Industry Co., Ltd. ; (6) Niihama works of the Sumitomo Aluminium Reduction Co., Ltd.; (7) To bauxite deposits in the islands of Palau, Yap and Ponape ; (8) To bauxite deposits of Malay Peninsula and Bintan ; (9) Takao works of the Japan Aluminium Co., Ltd. ; (10) Alunite deposits ; (11) Fluorspar deposits ; (12) Fushun works of the Manchuria Light Metal Mfg. Co., Ltd. ; (13) Proposed Kirin works of the Manchuria Light Metal Mfg. Co., Ltd.

In 1917 J. Takamine undertook to promote a company for the production of aluminium in Japan. It was contemplated that the Aluminium Company of America might co-operate financially and also supply bauxite, but, after negotiations, the American firm did not participate. Finally the Toyo Aluminium Co., Ltd., was founded in December, 1919, by Takamine and Japanese associates, being capitalized at ten million yen, and a license was obtained to build a hydro-electric power plant in Toyama Prefecture. Owing to financial difficulties the company had to abandon its projects in 1920.

Scheme Fails

Y. Takejima, formerly with Japan Aluminium Industrial promoted the Dai Nippon Aluminium Co., Ltd., at Dairen, Manchuria, in 1919. He planned to produce alumina from clay in Manchuria and ship the material to Japan for electrolysis, but this scheme failed to materialize. Some other projects were talked about in subsequent years as late as 1930, but none led to the industrial production of aluminium.

So far as is known, bauxite is not found in Japan. Much research work was carried out there during the decade following 1919 with the object of developing methods for the preparation of alumina from various other aluminous rocks. Certain processes were devised that are now, or have recently been, used in practice.

Considering the advanced position of the working-up industry in Japan it may seem surprising that aluminium production was taken up so late. One deterrent was the lack of bauxite, another was the lack of capital—or, at least, the belief held by industrialists and bankers that capital could be employed more profitably in other fields. These hindrances were outweighed at length by certain elements arising in the situation. The most important factors which led to the initiation and subsequent expansion of aluminium production in Japan may be summarized as follows: (1) An increasingly large total consumption (covered mostly by imports); (2) the pressure of military authorities; (3) a desire for self-sufficiency; (4) the considerable consumption by individual companies; (5) the view that selling prices of imported metal were generally too high in respect of costs; (6) the depreciation of the yen; (7) surplus hydro-electric power, and (8) a desire to increase exports of manufactures at low prices.

In 1929 the total consumption of raw aluminium in Japan was upwards of 14,000 metric tons, supplied to the extent of about 85 per cent by imports of primary metal, the remainder being domestic scrap. In 1930 the consumption was about the same, covered in similar proportion. Interest in producing the metal at home was naturally stimulated by the rise of imports over the period 1920-9. Preparation for war was also a potent force in connection with plans for assuring supplies of raw materials, particularly for the manufacture of aircraft. On account of the war with China additional impetus has been given to sundry projects. Coupled with defence measures self-sufficiency has been the desire in Japan, as elsewhere—to improve the national economy by reducing imports and increasing exports. The Government has encouraged the primary aluminium industry by granting some subsidies and by raising the import duty. Also, it has lately forced the use of aluminium as a substitute for other metals. With cheap labor, a depreciated currency, and lower first cost of raw aluminium Japan may be in a position to increase considerably its exports of aluminium goods to some markets.

The object of the present paper is to discuss the development and present status of the Japanese aluminium industry. Certain unorthodox processes have been applied for preparing alumina in Japan and these are described briefly.

Ore Supplies

As already mentioned bauxite has not been found in Japan. While occurrences of bauxite have been reported in Manchoukuo these are evidently clays, mostly in the form of shale. Deposits of alunite and of clays rich in alumina occur in Japan proper and Chosen (Korea), but neither alunite nor clay is economically competitive with bauxite as the source of alumina for aluminium reduction, although one or the other of the former materials has been used as ore by nearly all Japanese producers. At the same time it appears that these interests have scoured the Far East, if not the world, for supplies of good bauxite and during the last few years arrangements have been made with mining companies in some foreign countries for the shipment of this mineral to Japan. Prospecting for bauxite is being done by Japanese producers and other concerns at a number of localities in the South Seas and the exploitation of promising occurrences has been started.

Large quantities of shale are known at Yentai, Fuchow, Pensiha, Chinchou, and other districts in Manchoukuo. The South Manchuria Railway Co., among others, has investigated the possibility of using shale as aluminium ore, while shale mined in Manchoukuo has been employed as ore by one aluminium company in Japan. It contains 50-60 per cent alumina. The shale at Yentai is to serve as raw material for the Manchoukuoan producer.

A number of alunite deposits have been found in Chosen, especially in the north, central and southern parts, the reserves in the southern district having been estimated at 18 million tons. There are extensive open-pit workings at Seisen. Alunite has been mined at several places in the Chosen region and utilized by Japanese aluminium producers as a source of alumina. Analyses of two alunite samples from Chosen are as follows: (1) Alumina, 29.20 per cent; potassium oxide, 7.22 per cent; sulphur trioxide, 29.98 per cent; silica, 20.85 per cent; ferric oxide, 0.96 per cent; sodium oxide, 0.83 per cent; and water, 10.56 per cent. (2) Alumina 32.25 per cent; potassium oxide, 7.29 per cent; sulphur trioxide, 32.32 per cent; silica, 16.85 per cent; ferric oxide, 1.02 per cent; sodium oxide, 1.18 per cent; and water, 10.45 per cent. Recovery is made of potassium salts in preparing alumina from alunite. The mine output of alunite from Chosen for 1934, 1935 and 1936 was, respectively, 56,330, 81,510 and 114,569 metric tons.

Deposits of alunite also occur in China, the largest being in the provinces of Chekiang and Anhwei. Chinese alunite has not been used as raw material for aluminium production, but has been considered for this purpose by both home and Japanese interests.

Extensive deposits of alum occur in North Daito Island, Loochoo group. It has been reported recently that these are to be worked and the material used for the preparation of alumina by a new concern organized by the Japan Sugar Co., Ltd.

Bauxite deposits have been found in China, but all appear to be low grade. The best-known occurrence is in the Poshan-Tzechuan district, Shantung Province. Analyses of samples made by the Chinese Geological Survey showed the following range of composition: Alumina, 39.39 to 59.61 per cent; insoluble matter (silica), 21.05 to 43.83 per cent; ferric oxide, 2.54 to 14.44 per cent; and loss on ignition, 12.88 to 14.95 per cent. Such bauxite is obviously not applicable in the Bayer process.

Bauxite from Indies

High-grade bauxite for the Japanese aluminium industry was first obtained from the Dutch East Indies. It was supplied by the Nederlandsche-Indische Bauxiet Exploiitatie Mij. (NIBEM), controlled by the Billiton interests, bauxite mines being operated by this company in the island of Bintan and elsewhere in the Rhio Archipelago. The reserves in the Dutch East Indies are evidently very large and although the bauxite may not be as uniform as is desired it is of good quality and suitable for treatment by the Bayer process. Mining was begun at Bintan Island in 1935 and before the end of 1936 about 10,000 tons of ore had been shipped to the works of the Japan Aluminium Co., Ltd., at Takao, Taiwan (Formosa). It has been stated that the NIBEM concern has contracted to furnish 24,000 tons of bauxite annually to the latter company for a period of 30 years.

Bauxite unsuitable for the Bayer process has been imported from Greece by one Japanese producer of aluminium. It has been used as ore in admixture with "hard clay" (shale) from Manchoukuo, the treatment for extraction of alumina being a smelting method. Other foreign sources of bauxite include Brazil and British India. The low-grade bauxite occurring in the Poshan-Tzechuan district, Shantung Province, China, has been considered by another producer.

Bauxite deposits have been discovered lately in the islands of Palau, Yap, and Ponape. These islands lie in Oceania, between about 5° and 10° north of the equator and between the 130° and 160° parallels east of Greenwich, and are under Japanese mandate. According to report the bauxite is of good quality, the reserves having been estimated at five million tons. Ponape Island is approximately 1,800 nautical miles from Yokohama and the other two islands are somewhat nearer. The South Sea Aluminium Mining Co., Ltd. (Nanyo Aluminium Kogyo K. K.) was organized at Tokyo in 1937 to exploit these deposits, its capitalization being two million yen. Participants in this enterprise include the South Sea Development Co., the Mitsui Mining Co., Ltd., the Japan Aluminium Co., Ltd., the Japan Electro-Chemical Co., Ltd., and the Sumitomo Aluminium Reduction Co., Ltd. The South Sea Development Co. is an undertaking established in 1936 by the Japanese Government for the economic promotion of various islands in the former Caroline group. The annual output of bauxite by the subsidiary company is expected to be 50,000 to 60,000 tons a year and the first shipment to Japan was to have been made late in 1937. It is thought that sufficient ore can be mined in the islands to fulfil the requirements of the several aluminium producers just mentioned. In any case this development is regarded as highly important for the welfare of the Japanese industry.

Another source of bauxite for the industry has recently been exploited in the state of Johore, South Malay Peninsula. Mining was started in 1936 and a considerable quantity of ore was shipped to Japan in 1937. According to report Japanese mining interests have been operating two properties in the area, one near Batu Pahat and the other near Sungei Kim Kim on the Johore Straits. The bauxite is said to be of satisfactory grade, but an estimate of the reserves has not appeared. The output from these mines in 1938 is expected to be upwards of 20,000 tons. One aluminium producer in Japan has contracted for a substantial supply of bauxite to be shipped monthly from Johore by the Ishihara Industrial Co., Ltd.

It has been reported recently that all important aluminium producers in Japan are using bauxite as ore, either in whole or in part. The indications are that the preparation of alumina there from other rocks will be entirely discontinued.

Auxiliary Materials

Japan is self-sufficient as to nearly all accessory materials required in the production of aluminium. These include caustic soda and other heavy chemicals, coal, fluorspar, and coke for electrodes. When the primary industry was being started certain materials were imported at first and some were furnished to producing units by associated or other companies. Most producers undertook later to manufacture the necessary chemicals and electrodes or to ensure control of supplies. The intention of all is to become independent as to raw materials.

Synthetic cryolite has been made in Japan by several companies, including the Sumitomo Chemical Co., Ltd., and the Japan Artificial Fertilizer Co., Ltd. Some aluminium producers are now making enough cryolite for their own requirements. The total plant capacity of the country for cryolite production is at present in excess of demand. Japanese imports of natural cryolite were 578 and 981 metric tons in 1935 and 1936, respectively.

Fluorspar is one of the important raw materials used in the preparation of synthetic cryolite. Deposits of fluorspar have been found in the Kokai-Do district, and elsewhere in Chosen, and also in Mukden Province, Manchoukuo. Supplies for the Japanese plants have been obtained from these regions. The total fluorspar output of the Japanese Empire in 1934, 1935 and 1936 was, respectively, 12,099, 9,722, and 8,740 metric tons. Fluorspar deposits also occur in Chekiang Province, China.

Up to 1936 almost all electrodes used by aluminium producers in Japan were imported, but in that year the home output was about 7,500 metric tons. Of this quantity approximately half was made by two aluminium companies for their own consumption and the rest by carbon manufacturers. The total capacity for electrode production at the beginning of 1938 has been estimated at 20,000 tons, which is ample to cover present requirements. The cost of manufacturing carbon electrodes at the Japanese aluminium works has been given as Y.150 a metric ton, against a price of over Y. 700 for imported electrodes. Converted at current exchange rates the cost figure corresponds to about 1.97 cents a pound, or, say, £8 18s. a long ton. This cost compares favorably with that of large electrode plants in other countries.

It has been stated that pitch coke, obtained from domestic sources, has been mostly employed for electrode manufacture in Japan. One aluminium producer there has been licensed to use the Söderberg continuous electrode. Supplies of petroleum coke have to be imported since the oil-refining industry is small.

The heavy chemical industry of Japan started to expand during the War. Since then it has been developed to produce enough sodium carbonate, caustic soda, sulphuric acid and other mineral acids, ammonia, chlorine, and certain other industrial chemicals to fill domestic needs, some excess capacity existing. Ample quantities of caustic soda and other chemicals used in the preparation of alumina are produced by aluminium companies or affiliated concerns and by outside manufacturers. In addition to alumina, aluminium fluoride and hydrofluoric acid are now made in Japan and offered in the market.

Fuel is an item of appreciable expense in the preparation of alumina by the Bayer or other wet-chemical methods, since heat is required for the evaporation of solutions and for calcination. Large amounts of bituminous coal are mined yearly in both Japan proper and Manchoukuo. Mines are operated by companies associated with some aluminium-producing units. The cost of coal for the aluminium industry is satisfactorily low.

Electric Power

In general, both the topography and climate of Japan are favorable for the development of hydro-electric power, the main island (Honshu) and the three smaller islands (Kyusha, Shikoku and Hokkaido) being mountainous. Numerous rivers rise in the central mountain regions, flowing on steep gradients, there are many lakes, and rainfall is plentiful. At present the bulk of hydro-electric output is generated in the central part of the main island.

A rapid growth of the electric-power industry began during the War, the total capacity of hydro-electric stations in 1922 being about 1.07 million kw. and that of steam plants about 0.71 million kw. In 1935 the respective figures were approximately 3.38 and 2.37 million kw. The total power of rivers in Japan proper has been estimated at 10.8 million kw.

Owing to the rapid increase of capacity there was considerable excess power available by 1932 or earlier. As already mentioned, one of the factors conducive to aluminium production in the country was surplus hydro-electric power. For several years before the production was taken up such power was offered in large blocks and at low rates on contracts for long periods. Most of the excess hydro-electric power was subsequently utilized or contracted for with the advance of the primary aluminium industry. A shortage of power appeared imminent in 1935 and plans were then projected for the construction, over the period 1936-1941, of additional hydro-electric stations with a total capacity of about 0.96 million kw. and of more steam plants with a combined capacity of about 0.84 million kw. This applies to Japan proper. Seven or eight years ago, when the exchange value of the yen was about 50 cents or 2s., the "standard" cost of hydro-electric construction was regarded as approximately Y.340 a h.p. This corresponds to $170 and £34.

Power Stations

Brief statements concerning power sources for most Japanese aluminium producers—with works in Honshu, Shikoku, Taiwan, and Manchoukuo—are given below.

Aluminium production on an industrial scale was inaugurated in Japan by the Japan Electro-Chemical Co., Ltd., at Omachi, Nagano Prefecture. Hydro-electric power is supplied by the Toshin Electric Co., Ltd., which operates 11 stations situated on three rivers—the Takase, Chikuma and Agano, the total capacity being 200,000 kw. The cost of electricity to the aluminium-producing company has been given as about 0.4 sen a kw.h. Figured at current exchange rates this price is nearly equivalent to 0.12 cent or 0.06d. a kw.h.

Electricity for the aluminium works of the Japan Soda Co., Ltd., at Takaoka, Toyama Prefecture, is furnished from a large hydro-electric station on the Kurobe River. This station is owned by the Japan Electric Power Co., Ltd., one of the "Big Five" power companies.

State power is supplied to the works of the Japan-Manchuria Aluminium Co., Ltd., at Higashi-Iwase, Toyama Prefecture, being generated at the Aimoto hydro-electric station of the Toyama Prefectural Government. A contract provides for delivery of 30,000 kw. for a period of 25 years, the price having been reported as "remarkably low." In order to obtain additional power required for projected increase of works capacity the company has applied for a permit to build its own hydro-electric plant in the vicinity.

The Taiwan Electric Power Co., Ltd., furnishes electricity for the works of the Japan Aluminium Co., Ltd., at Takao, Taiwan. A long-term contract provides for delivery of the necessary power at "a low price." The former company was founded in 1919 and shortly proceeded with plans for a large hydro-electric undertaking to utilize the water of Lake Jitsugetsutan. Work had soon to be suspended and was not resumed until late in 1929. The project has since been completed.

A virtual monopoly of the electric power industry in Manchoukuo has existed since the Government established the Manchuria Electric Corporation on December 1, 1934. This company was formed by merger of the various independent electric concerns and is capitalized at 90 million yuan. The Manchuria Light Metal Mfg. Co., Ltd., was subsequently founded to produce aluminium. In accordance with initial plans power is supplied to the first reduction works from a large steam plant at Fushun, where cheap coal is abundant. A scheme for large hydro-electric undertakings has lately been drafted by the Government, one object of this being to provide power at low cost for the home aluminium industry. Among other projects an hydro-electric station is to be constructed on the Second Sungari River, about 15 miles upstream from the city of Kirin. The generating capacity will be 180,000 kw. An aluminium works is to be built near Kirin.

Aluminium Producers

As mentioned at the outset Japanese production of primary aluminium was begun in 1934, one company making the metal in that year. In 1937 four companies operated reduction works in Japan proper and one in Taiwan. Industrial production in Manchoukuo was expected to start late in 1937 or early in 1938.

Some particulars concerning the location or works, capitalization, and activities of the various aluminium-producing companies are given in what follows.

The first aluminium producer in Japan was the Japan Electro-Chemical Co., Ltd. (Nippon Denki Kogyo K.K.), with a capitalization of 12 million yen. It succeeded the Japan Iodine Co., Ltd., and was promoted by interests active in this concern as well as in the Showa Fertilizer Co., Ltd., and the Toshin Electric Co., Ltd. The works of the Japan Electro-Chemical Co., Ltd., are at Yokohama and Omachi, alumina and cryolite being made at the former city, while carbon electrodes and aluminium are produced at the latter. The annual capacity of the Omachi works when first started in 1934 was about 600 tons of aluminium, which was increased to 3,000 tons in the same year. The capacity at the end of 1937 was about 6,000 tons and further enlargement has been projected. The company first used alunite from Chosen as ore, but in 1937 it contracted for 20,000 tons of Malayan bauxite to be delivered yearly.

Second in order of starting aluminium production was the Japan-Manchuria Aluminium Co., Ltd. (Nichi-Man Aluminium K.K.). This company was founded in October, 1933, with a capitalization of five million yen. This was raised to ten million yen in 1936 and to 20 million yen in 1938. The works are situated at Higashi-Iwase, Toyama Prefecture, on the Sea of Japan, alumina, cryolite, electrodes, and aluminium being produced here. The first output of metal was made in the spring of 1935, when the capacity was about 400 tons a year, which was soon increased to 5,000 tons, while at the end of 1937 it was about 7,000 tons. Additional equipment is being installed and the capacity is expected to reach 12,000 tons before 1939. A thermal smelting process has been employed by this company for extracting alumina from shale and bauxite.

The Sumitomo Aluminium Reduction Co., Ltd. (Sumitomo Aluminium Seiren K.K.) is another producer, being owned by the Sumitomo Goshi Kaisha, the holding company for all enterprises of the Sumitomo interests. This reduction unit was established in 1934, aluminium being first produced in 1936. The capitalization is ten million yen. The electrolytic works and electrode factory are at Niihama, Ehime Prefecture, while alumina and cryolite are made at a nearby plant of the Sumitomo Chemical Co., Ltd., an associated concern. Part of the alumina consumed has been supplied by the Shikama Chemical Industry Co., Ltd., with a plant at Shikama, Hyogo Prefecture. Both have used alunite as raw material for making alumina. The power for the aluminium works is partly hydro-electric and partly steam and the capacity for metal output at the end of 1937 was about 2,500 tons a year. Extensions to 4,500 tons in 1938 and to 10,000 tons in 1939 have been projected. The South Sea Aluminium Mining Co., Ltd., has recently contracted to deliver 20,000 tons of bauxite annually to the Sumitomo Chemical Co., Ltd. Practically all aluminium so far produced by the Sumitomo firm has been used for manufactures in plants of affiliated companies.

A primary aluminium producer with works outside Japan proper is the Japan Aluminium Co., Ltd. (Nippon Aluminium K.K.). It was formed in 1935 and capitalized at ten million yen. Participants in the enterprise include the Mitsui, Mitsubishi, Sumitomo, and Furukawa interests, and the Taiwan Electric Power Co., Ltd. The capital is to be increased to 30 million yen. In view of its financial and other connections the Japan Aluminium Co., Ltd., may become the dominant aluminium producer of the Far East. This company appears to be well integrated, from ore through manufacture, and it is associated with the international aluminium cartel (Alliance Aluminium Cie.). The site of all works is at Takao, Taiwan. Metal was first produced by the Japan Aluminium Co., Ltd., late in 1936, the capacity for aluminium output at the end of 1937 being 6,000 tons. This was to be raised to 8,000 tons in 1938 and subsequently to 12,000 tons. The ore used by the company is high-grade bauxite and treatment is by the Bayer process. Its cost of producing aluminium is evidently the lowest among Japanese companies.

New Company Begins

Another company which has recently begun to produce aluminium is the Japan Soda Co., Ltd. (Nippon Soda K.K.). This is one of the four largest makers of heavy chemicals in Japan, the aluminium works being at Takaoka, Toyama Prefecture. Operations were started about the middle of 1937, the capacity at the end of that year being given as 3,000 tons. An extension to 8,000 tons has been projected for completion in 1939. According to report bauxite is supplied under contract by an independent mining company in British India. The Bayer process is employed for extracting alumina.

The aluminium producer in Manchoukuo is called the Manchuria Light Metal Manufacturing Co., Ltd. (Manshu Keikinzoku K. K.). This company was established in November, 1936, and its capitalization is 25 million yuan. Participants in the concern are the South Manchuria Railway Co., the Government of Manchoukuo, the Sumitomo interests, the Japan Soda Co., Ltd., and the Japan-Manchuria Aluminium Co., Ltd. Stock owned by the railway company and the Government amouts to 14 and 10 million yuan, respectively; the other three have only minor holdings. Construction of an electrolytic works was started in 1937 at Fushun, about 30 miles east of Mukden, the initial capacity being 4,000 tons of aluminium a year. Another works with a capacity of 16,000 tons has been projected under the Manchoukuoan Five-Year Plan. This is to be built near Kirin. Alumina for both aluminium works is to be made at Fushun, shale mined at Yentai to serve as ore. Yentai is about 30 miles south of Mukden. The Pedersen process is said to be employed for preparing alumina.

A number of additional companies have announced intentions to engage in aluminium production. In 1936 the Japan Sugar Co., Ltd., founded a subsidiary concern, called the Nitto Kagaku Kogyo K.K., for this purpose. The Nasu Aluminium Co., Ltd., was formed in the same year with capitalization of 1.5 million yen, it being reported that the Mitsui and Mitsubishi houses are financially interested. The initial capacity as projected is 2,000 tons a year. Another prospective producer is the Osaka Yogyo Cement Co., Ltd., which proposes to extract alumina from Chinese clay by a smelting process. In 1937 the Chosen Riken Industrial Co., Ltd., was established with a capitalization of ten million yen. The capacity of its projected works in Chosen has been given as 6,000 tons of aluminium a year. Another company founded in 1937 is the Tohoku Aluminium Co., Ltd., with a capitalization of ten million yen. This concern is affiliated with the Tohoku Development Co., Ltd., which is subsidized by the State. According to report a works is to be built at Konahama, Fukushima Prefecture, with an initial capacity of 3,000 tons a year. The Chosen Nitrogen Fertilizer Co., Ltd., plans to erect an aluminium works at Tumen with a capacity of 10,000 tons, which is to be operated by a subsidiary company capitalized at 12 million yen. Also, the South Sea Aluminium Mining Co., Ltd., may undertake production of the metal in addition to bauxite mining.

Announcement was made at Tokyo early in June, 1938, that a new company was to be founded by the Mitsui, Mitsubishi and Sumitomo interests, and the Tokyo Electric Light Co., Ltd. Capitalization is to be 100 million yen. An aluminium-reduction works with an annual capacity of 50,000 tons is planned.

It may be noted in passing that magnesium is produced by the Japan-Manchuria Aluminium Co., Ltd., and the Japan Soda Co., Ltd.

Table 1 gives the nominal capacities for primary aluminium output of the first six operating companies at the end of 1937. Their intended capacities after projected additions have been completed within about four years are also shown. Apart from these producers the companies named in the third preceding paragraph have proposed to construct works with a total capacity of about 27,000 tons of aluminium a year. Thus, the total capacity of present and prospective producers as of 1940-1 may be estimated at upwards of 100,000 tons. In accordance with the Japanese Five-Year plan as recently announced by the Department of Commerce and Industry it is intended to increase capacity to about 120,000 tons. The proposal is to produce yearly about 75,000 tons in Japan (including Taiwan and Chosen) and about 45,000 tons in Manchoukuo. A national cartel of all producers is to be organized under State direction in order to further this plan.

Fig. 1 is a map which shows the locations of aluminium works and other points of interest in connection with the Japanese aluminium industry. Some details are given in the subjoined key.

Alumina Processes

During the early development of the Japanese aluminium industry the production of metal was based on ore other than bauxite. As stated previously, alunite-bearing rock has been used to a considerable extent for the purpose. The application of this material in Japan seemed feasible for more than one reason. For example, there is plenty of alunite in the country, but no bauxite, and Japan is poor in other sources of potassium compounds, for which the demand is large. Besides, the industry was urged by the military authorities to employ only domestic raw materials. Hence it appeared desirable to work alunite for alumina with by-product recovery of potassium salts. Experience here, as elsewhere, has again proved that alunite (and also clay) is not economically competitive with high-grade bauxite as ore for aluminium production.

TABLE 1.—CAPACITIES OF JAPANESE ALUMINIUM PRODUCERS

Company	*Annual capacity, metric tons* At the end of 1937	*Annual capacity, metric tons* After additions (1938 to 1941)
Japan Electro-Chemical Co., Ltd.	6,000	15,000
Japan-Manchuria Aluminium Co., Ltd. ..	7,000	12,000
Sumitomo Aluminium Reduction Co., Ltd..	2,500	10,000
Japan Aluminium Co., Ltd.	6,000	12,000
Japan Soda Co., Ltd.	3,000	8,000
Manchuria Light Metal Mfg. Co., Ltd. ..	4,000	20,000
Totals	28,500	77,000

Several processes have been used in Japanese practice for the preparation of alumina from rocks other than bauxite. These are described briefly below.

A method devised by Hiromu Tanaka has been applied by the Japan Electro-Chemical Co., Ltd., for extracting alumina from alunite. In the process alunite is first calcined at 600° C., cooled, and suspended in water. Ammonia is then passed, ammonium and potassium sulphates being in solution after the reaction, while alumina and silica remain as residue. Next the mixture is filtered and the two sulphates recovered from the filtrate. The residue is treated as in the Bayer process in order to obtain alumina, silica, being separated from the sodium aluminate formed.

Another process for alunite, developed by T. Okazawa, has also been used by the Japan Electro-Chemical Co., Ltd. In this preliminary calcination is not necessary. According to this method the crude alunite is treated with caustic potash, yielding potassium sulphate and aluminate. The former is insoluble in the alkaline liquor and hence is separable. Aluminium hydroxide is precipitated from the solution of potassium aluminate and alumina is then recovered as in the Bayer process.

An acid method for the treatment of alunite worked out by H. Asada has been used by the Shikama Chemical Industry Co., Ltd. After calcination at 600° C. the material is attacked with sulphuric acid, the aluminium and potassium passing into solution as sulphates, silica remaining as residue. Potassium alum is crystallized from the filtrate and heated under pressure in an autoclave, whereby practically pure alunite is regenerated. Next, this alunite is calcined to decompose the contained aluminium sulphate, sulphur trioxide being recovered. Potassium sulphate is then extracted from the calcine by leaching with water, alumina being left. The liquor from the autoclave contains sulphuric acid and potassium sulphate. It is used for treating fresh raw material.

A combined acid and alkali process has been applied to alunite by the Sumitomo Chemical Co., Ltd. In this method the material is first roasted, cooled, ground, and then treated with sulphuric acid. After settling and removing the undissolved matter the solution is cooled to crystallize out potassium alum. The crystals are separated from the remaining solution of aluminium sulphate by centrifuging. Aluminium hydroxide is precipitated by means of ammonia, the precipitate being dissolved in caustic soda and silica removed by filtration. Then alumina is obtained from the sodium aluminate solution as in the Bayer process. Potassium and ammonium sulphate are recovered as by-products in the Sumitomo process.

The Japan-Manchuria Aluminium Co., Ltd., has employed a smelting process for extracting alumina from clay and bauxite containing considerable silica, the method being credited to T. Suzuki and Hiroshi Tanaka. It is practically the same as the so-called dry process previously developed by the Aluminium Company of America. In the practice of the Suzuki-Tanaka method clay containing upwards of 45 per cent alumina is smelted with scrap iron and coke in an arc furnace, silica and iron oxide in the clay being thus reduced. The products are impure alumina and ferro-silicon, which separate by gravity, liquid alumina rising to the surface of the bath. The alumina is tapped off to freeze and then crushed. It is finally treated with chlorine at about 400° C. in order to remove iron, silicon, and titanium.

Several other processes for extracting alumina from alunite or clay have been tried in Japanese practice, but have been abandoned.

The standard Bayer process, applicable to bauxite with low silica, has been used from the start of operations by the Japan Aluminium Co., Ltd.

Some other companies which have recently begun to treat high-grade bauxite have also been employing the Bayer process. As indicated previously, it appears that most Japanese producers will use bauxite as ore in the future, rather than alunite or clay. The conclusion is that the Bayer process will be generally employed in Japan as in other countries.

Statistics

Aluminium was used in Japan for many years mostly in the manufacture of cooking utensils, tableware, and the like. Consumption for these products was formerly up to about 70 per cent of the total, but in recent years it has ranged between 15 and 30 per cent. The metal is now being employed for numerous purposes as in foreign industrial countries. An estimate as to the distribution of Japanese consumption in 1934 is as follows: Transport (land, water, and air), 38 per cent; electric cables and wire, 17 per cent; household utensils and food equipment, 16 per cent; machinery, eight per cent; steel metallurgy, eight per cent; non-ferrous alloys, four per cent; building, three per cent; chemical equipment, two per cent; and other uses, four per cent. Demand by the aircraft and motor industries has increased markedly during the last five years. The total aluminium requirement of the country for 1938 has been forecast at 40,000 metric tons, which corresponds approximately to 0.98 lb. per capita for the Empire (including Chosen and Taiwan) and 1.36 lb. for Japan proper.

TABLE 2.—JAPANESE OUTPUT OF PRIMARY ALUMINIUM

Year	*Metric Tons*	*Year*	*Metric Tons*
1934	700	1936	7,500
1935	4,700	1937	10,500

Table 2 gives the figures reported by the Metallgesellschaft A.-G. for Japanese output of primary aluminium. The statistics in Tables 3 to 6 inclusive are mostly from the "Aluminium Year Book, 1937." Figures for imports and exports in 1937 have not appeared as yet.

Table 3 gives the imports of primary aluminium over the period 1900-1936. Annual consumption, as reflected by these figures, has been large enough to justify home production since 1918. Japan has imported primary aluminium from various countries, the bulk of metal having been supplied by Canada, Switzerland, and the United States during the last 12 years. Lesser quantities have been drawn from France, Germany, Norway, and the United Kingdom.

Considerable amounts of aluminium scrap were imported by Japan over a short period. Table 4 shows the scrap imports for 1929-1936. The amounts taken before 1929 were insignificant. Imports of scrap have declined as home output of primary metal has increased.

Japan is not an important export market for semi-finished and finished manufactures of aluminium. Some quantities of foil and sheet are, however, still imported.

TABLE 3.—JAPANESE IMPORTS OF PRIMARY ALUMINIUM

Year	*Metric Tons*	*Year*	*Metric Tons*
1900	95.5	1919..	1,507
1901	37.6	1920..	2,012
1902	97.5	1921..	1,808
1903	108.7	1922..	3,937
1904	395.2	1923..	3,647
1905	147.3	1924..	4,143
1906	199.1	1925..	4,651
1907	839.2	1926..	7,421
1908	436.9	1927..	5,825
1909	390.1	1928..	9,167
1910	466.3	1929..	11,893
1911	435.9	1930..	10,965
1912	986.5	1931..	2,788
1913	318.0	1932..	4,795
1914	487.7	1933..	3,606
1915	487.7	1934..	5,342
1916	754.9	1935..	9,774
1917	799.6	1936..	9,011
1918	883.9		

Exports of aluminium products from Japan to countries in the Far East have increased during late years owing to the depreciation of the yen and the low prices quoted. Aluminium utensils are exported mainly to China, Hongkong, the Dutch East Indies, Kwantung Province, Manchoukuo, the Philippine Islands, Siam, and the Straits Settlements, while considerable quantities of sheet have been shipped to British India. About 2¼ million pounds of sheet were exported from Japan in 1935, this being the maximum quantity of any year. Over 1.9 million pounds of ware were exported also in 1935. Japanese exports of aluminium foil to countries in the Orient have increased significantly in the last few years. It is believed in the working-up industry that exports of various manufactures can be substantially expanded now that primary aluminium is produced at home. Large amounts of canned foods are shipped from Japan and aluminium containers have come into use lately for canning, particularly for crab meat. Table 5 gives the yen values of aluminium manufactures exported from Japan over the period 1913-1936. The annual quantities prior to the War were trivial.

TABLE 4.—JAPANESE IMPORTS OF ALUMINIUM SCRAP*

Year	*Metric Tons*	*Year*	*Metric Tons*
1929	360	1933	4,672
1930	636	1934	5,604
1931	2,415	1935	4,305
1932	3,846	1936	1,695

*Including aluminium-alloy scrap.

The market price of primary aluminium in Japan has varied considerably over a period of years. Among other influences it has been affected by fluctuations of the yen against other currencies, sporadic competition among foreign producers, and control by international cartel organizations. Table 6 shows the average yearly prices for 1921-1936. Domestic primary aluminium, 99 per cent minimum, was offered at Y.155 per 100 kg. in 1935. The price was increased to Y.165 in 1936. On account of the war boom the spot price rose from about Y.191 to Y.223 in the first quarter of 1937.

Japanese import duties on raw aluminium and most manufactures were formerly rather low. In 1932 the duties under the general tariff were as follows: Ingots and related material, Y.3.20 per 100 kin; bars, rods, and sheet Y18.50; wire and tubes, 20 per cent *ad valorem;* and scrap, five per cent. Greatly increased duties became effective at June 1, 1936. These are as follows, in yen per 100 kin; Ingots, slabs, and granules, 17.70; bars, rods, plates, and sheet, 38.30; foil, 55.80; and scrap, 17.70. The duty (1936) on wire and tubes is 25 per cent *ad valorem.* Converted at current exchange rates the duties are respectively equivalent to: 3.9 cents or 1.95d. a pound; 8.3 cents, 4.15d.; 12.3 cents, 6.15d.; and 3.9 cents or 1.95d. a pound. In general the tariffs on manufactures are prohibitory.

Working-Up Industry

Aluminium cooking utensils, other hollow ware, and sheet have been made in Japan for many years. The manufacture of most other products has been taken up since 1920, Osaka being the center of the aluminium products industry. About 70 per cent of ware output has been made there up to now. The number of Osaka plants in which aluminium manufactures are produced exclusively is upwards of 100, but most of these are small. Tokyo is also an important city in the manufacture of ware.

Aluminium sheet was rolled as early as 1901 in a copper mill of the Sumitomo interests. At present there are 18 companies which operate aluminium rolling mills in Japan, ten at Osaka, six at Tokyo, and two elsewhere. Most sheet producers manufacture utensils and other light goods. Wrought aluminium-alloy products are made by about 20 companies either for the market or for their own use in manufactures. The Japanese output of aluminium foil has increased greatly within recent years, subsidies being granted by the Government to promote the manufacture of foil. It is made at present by eight concerns, which are mostly small. One company, however, produces approximately 100,000 lb. of foil a month. Large manufacturers of semi-finished aluminium products, including duralumin, are the Aluminium-Sumitomo, Ltd., and the Furukawa Electric Industrial Co., Ltd.

The production of aluminium cables and wire is a rapidly growing branch of the working-up industry. Consumption of metal for these purposes in 1938 has been forecast at 20,000 tons. A subsidiary of the Sumitomo house is an important maker of cables.

TABLE 5.—JAPANESE EXPORTS OF ALUMINIUM MANUFACTURES

(In thousands of yen)

Year	*Value*	*Year*	*Value*	
1913	116.8	1926	1,063.2	
1914	41.6	1927	1,088.8	
1915	546.6	1928	845.1	
1916	230.4		Ware†	Sheet†
1917	871.4	1929	85.6	482.6
1918	1,231.6	1930	706.6	744.3
1919	1,791.6	1931	342.0	222.6
1920	999.9	1932	410.5	478.5
1921	301.5	1933	1,126.9	376.5
1922	458.6	1934	1,930.7	534.2
1923	544.2	1935	1,660.9	1,653.7
1924	678.4	1936	1,727.5	1,301.1
1925	1,339.1			

†Sheet and ware not segregated in the statistics until 1929.

As already pointed out numerous concerns are engaged in making cooking utensils and other fabricated wares. Development of the light goods industry was slow up to about 1915 and none of the manufacturing plants was large, but a marked expansion followed during the next decade, which is shown by the increase in the number of exclusive aluminium factories at Osaka. In 1916 the total number was seven, while in 1926 it was 52. Among present concerns in the aluminium goods field the following are large manufactures: Japan Aluminium Works, Ltd.; Ikeda Aluminium, Ltd.; Osaka Aluminium Works, Ltd.; and Nasu Aluminium Works, Ltd. These are often referred to as the "Big Four" of the aluminium fabricating branch. The last-named operates a plant at Tokyo and the other three at Osaka.

The first aluminium-alloy foundry in Japan was opened in 1903, but little application was found for cast products until after 1920. There are now about 15 Japanese foundries wherein castings of aluminium alloys are made exclusively. Such castings are also produced in foundry departments of manufacturing companies engaged in the motor-vehicle, aircraft, special machinery, and general engineering trades.

TABLE 6.—AVERAGE PRICES OF PRIMARY ALUMINIUM IN JAPAN

(In yen per 100 kg.)

Year	*Price*	*Year*	*Price*
1921	86.24	1929	104.98
1922	89.70	1930	96.59
1923	110.14	1931	91.45
1924	131.71	1932	131.14
1925	143.06	1933	187.94
1926	122.62	1934	171.46
1927	111.27	1935	170.83
1928	111.27	1936	178.63

Aluminium powder and paint are made by several concerns.

Secondary aluminium began to be used in considerable quantities after 1930 for the manufacture of both cast and wrought products. The center of the secondary industry is at Osaka, where five companies operate recovery plants. A large producer of secondary aluminium for the market is the Daiki Aluminium Works, at Osaka; ingot capacity is about 3,600 tons a year. Another producer is the Daido Aluminium Smelting Works, also at Osaka. It was established under joint ownership of the so-called Big Four and a subsidiary of the Mitsui house.

It is of interest to remark that aluminium has been used extensively during the last few years by the Japanese manufacturing industries in general. Aside from motor vehicles, aircraft, cables, utensils, and various war purposes, the metal has been increasingly employed for chemical apparatus, brewing equipment, telephone and radio parts, rolling stock, ship building, and in the assembly of textile machinery. Aluminium foil is favored for packing food and tobacco. The anodic oxidation process is utilized for numerous applications. Under the war economy plan announced by the Government late in June, 1938, the use of aluminium, among other materials, was restricted to "essential" purposes.

The aluminium working-up industry is well organized in respect of so-called trade associations. Nine sheet producers are members of the Kansai Aluminium Rollers' Association. Another body is the Kansai Aluminium Kettle Industrial Association, with 15 members. Also, 22 makers of general wares are united in the Kansai Aluminium Manufacturers' Association. These three organizations have headquarters at Osaka. Still another group is the Tokyo Association of Aluminium Manufacturers with nine members. These associations are actually cartels. Among other activities they undertake to standardize grades of aluminium manufactures, fix prices, control output, and promote sales.

General Discussion

As has been shown the primary aluminium industry of Japan has developed rapidly during the last four years. Aluminium was produced in 15 countries in 1937 and Japan ranked tenth as to output. If present plans are consummated, the country will become one of the largest producers by 1940-1. Factors favorable to the expansion have included the pronounced tendency toward general industrialization since 1929, the substantial consumption of metal, and cheap power. The situation in respect of ore supplies was formerly unfavorable, but now seems to be satisfactory.

The national economy of Japan may be improved somewhat by substituting domestic aluminium for other non-ferrous metals that are imported—especially lead, tin, and zinc. Some figures indicate the possibilities in this direction. Thus, for the years 1933-6, both inclusive, the average domestic output of lead was eight per cent of the total consumption. Similarly, in the same period, the percentages for copper, tin, and zinc were 68.9, 26.5, and 44.8, respectively. In the calculation no account was taken of secondary metal output. At any rate the considerable deficiency of these several metals suggests that there is wide scope for the use of aluminium as a substitute material.

The cost of producing primary aluminium by Japanese companies that have used raw materials other than good bauxite as the source of alumina has undoubtedly been high. In the case of one company basing operations on alunite the cost has been reported as about Y.1,500 a metric ton. It is probably right. This figure corresponds to about 19.7 cents or 9.9d. a pound and is far above the average cost of major foreign producers. By contrast the cost of the one Japanese company that started operations based on high-grade bauxite is claimed to be about Y.800 a metric ton. This is approximately equivalent to 10.5 cents or 5.3d. a pound and is in line with the alleged costs of some foreign producers.

At this juncture it is evidently recognized by Japanese companies that the business of undertaking to produce aluminium from inferior ore was a serious and costly mistake. The same mistake was made by the Soviet Union. It is on the way to being corrected in both countries.

The immediate outlook for the primary aluminium industry of Japan is conditioned mainly by the duration of the war with China. Soon or late thereafter will come the inevitable depression. In view of the large capacity for aluminium output which is in operation, being built, and projected for early construction it looks as though the Japanese producers are in for a spell of bad times after the war, but countervailing action will presumably be taken by the Government. Support for the industry may comprise subsidies or loans to companies in financial difficulties and decrees forcing the use of domestic aluminium in place of imported metals. Moreover, the number of producers is likely to be reduced in the future by mergers, either voluntary or under edict. Also, the present interlocking of interests points to the early formation of a national cartel which should be beneficial. The long-term outlook for the industry appears to be good.

Aluminium developments in Japan have already had, and promise to have still more, far-reaching effects in the world markets. Now that home production has been established and import duties have been raised, the country is numbered in the growing list of political areas which are or can be closed against outside metal, both crude and manufactured. At any rate Japan is soon to be self-sufficient as to aluminium and foreign supplies will be barred unless needed by the national economy considered as a whole. Furthermore, Japan is determined to dominate the foreign aluminium markets of the Far East, where it has begun to displace western countries in the export of manufactured products. Finally, it hopes to expand exports of aluminium goods to South America, Africa, and even to some countries which produce primary metal.

Mine Timbering in the Philippines

(Continued from page 351)

In stoping operations in the Baguio district many problems are met which require an expensive system of timbering to overcome. The main features of these problems are: weak hanging and foot walls due to the conditions given in Group III and V, width of stopes which vary from a few inches to thirty or more feet, and excessive water in the typhoon season. To meet these problems one of the most successful methods used to date is the "slice and fill square set system." In this system the drift levels are run at 100-foot vertical intervals and raises are put in at intervals along the strike of the vein at distances varying from 50 to 100 feet. These raises are used for several purposes, such as: blocking out of ore bodies for evaluation, for manways and for filling stopes with waste rock. The square set stope is then started using these raises as starting points with the sets being put in the width of the vein and two to three sets along the strike of the vein. The overhead method of mining is used, which means that the sets start at the lower level and are worked upwards to the next level. When the upper level is reached the sets are filled with waste after cleaning out all remaining commercial ore and the next slice is started while the old one is being filled. The hanging wall and the outside sets are "lagged" (planks or slabs put in between posts to form a wall) in order to prevent small pieces from falling and to distribute the resistance of the main members as well as to keep the "fill" from entering the adjoining slices. The ore is drawn from the stope as needed by means of chutes at the bottom which empty into cars on the level below. Fill is dumped into the completed slice from cars on the level above. The square set itself is composed of a cap, a girt or brace, and a post. These members meet so as to form a 90° angle. They are framed at the intersection so as to form a compression joint and join with three similar members. An open framework or "cajon" as it is called among the native miners is the result. These "cajones" are built up and extended as the excavation of the ore proceeds. The first tier members are called the still floor, and they are usually started on a foundation of long timbers called "sills." The succeeding tiers are called, consecutively; first floor, second floor, etc. The set as used locally is usually composed of 8-in. by 8-in. timbers for the posts and caps, and 8-in. by 6-in. timbers for the girts. Each set is usually five feet square and six to seven feet high. Figure I shows such a stope in longitudinal and cross-section.

A Costly Method

Due to the great amount of timber required, which will come to two or three pesos per ton of rock broken and to the labor costs of framing, handling and erecting, this method is one of the most costly of the mining systems and is used only when conditions are such that cheaper methods are inadvisable. Other methods such as rill stoping, block caving, top slicing, shrinkage stoping, etc., are used for different types of rock masses but except in special cases these methods are not applicable in the Baguio District. Needless to say, when another method can be used, the engineer in charge will make use of it. As the workings become deeper and get away from the effects of tropical erosion, conditions tend to become better and sometimes other methods can be used. In stopes that are only two to three feet in width it is sometimes possible to use "stulls" in a rill stope or to make use of a modification of the square set method.

There is a great variety of designs for tunnel timber dependent upon the stress to be withstood. Tunnel timbering requires much more repair work than stope timber since tunnels (drifts, crosscuts, adits, etc.) are usually kept open for much longer periods of time. A common form used in the Philippines is shown in Figure II. This form is used either with or without the sill piece depending upon the character of the rock. Figure III shows crown bars or "spiling" used where the type of rock described in Group V is encountered. Slow progress is made in this type of ground and much care must be taken by the miners if they are not to lose their heading.

Building Foundations in Manila

By H. V. CAMPBELL, Licensed Civil Engineer, Member American Society of Civil Engineers, in the American Chamber of Commerce Journal

THE serious settlement of many of the new five and more story buildings in Manila is well known to owners, architects and engineers and is also common knowledge of the public. Obviously, the settlement is due to inadequate foundations. The buildings, settled considerably without the help of the last severe earthquake, and no doubt will settle further, which may not be so well known.

The inadequate foundations are generally not a fault of the architects' and engineers' designing ability, but most probably are due to custom, money available for the foundation, or fear that a foundation never before used in Manila would be difficult and mostly to sink.

Foundations, especially for bridges, have quite a history in the development of many types and methods of construction. Design has varied for the particular subsoil upon which it was to rest, the depth of mud, water, sand, etc., above bed rock, being taken into consideration. The methods of construction of bridge foundations have changed fast in late years with the new developments in material and equipment, but there has not been so much change in the principles of design except for additional knowledge of the bearing capacity of soils.

Foundations for buildings have not the variety either in design or methods of construction, as it is only in comparatively late years that the sky scraper came into existence, and with it the quick change in foundations and methods of sinking them. Formerly a simple footing with or without piles and grillage was about all that was used or required. About 1890 the practice commenced of extending building foundations down to bed rock. With it came the open well methods and the air-lock caisson. Still later, when not to great a depth, the reinforced concrete pile and steel pile.

The practice here for large building foundations generally is to use some type of spread foundation, as a flat reinforced concrete slab laid directly on the soil, some times called a floating foundation, or a combined footing of slabs covering most or all of the building area with piles below sustained by friction, called a raft foundation, or a foundation of piles sustained by friction, or a combination built up from such foundations to the building superstructure base with cells, cantilevers, grills or other means.

Possibly grilled footings have also been used.

Reinforced Concrete Not Used

Much attention has been called to the foundations of the old Spanish churches in the Philippines, some have a so-called rocker foundation which, so it is said, is built with adobe rock in the form of an inverted arch, the foundation as a whole having the form of an egg cut in half lengthwise. When the churches were built, reinforced concrete was unknown and the ordinary footing under the walls was the common practice, as in small buildings of to-day. A simple reinforced concrete slab would take the place and be a better foundation economically than the inverted arch, and equal or better in resisting earthquakes.

It is no great feat to design a foundation for a building such as a church which has horizontal dimensions, both width and length, greater than the height, with only a single floor and no limit to the area that can be used beyond the building area. But the same type of design will not serve for a modern five or more story building, where foundation area is limited to the area the building covers.

There is reported to be in Manila an old church that has a foundation under the arches supporting the roof designed somewhat on the principle of a conduit or brick arch sewer with the base an inverted flat arch, a device which has been commented upon as a lost art.

Chicago in early days used somewhat the same type of foundations as are used in Manila, spread and friction pile foundations and possibly also the inverted arch, which was certainly used in Europe at that time. In 1890 Chicago commenced extending the foundations down to bed rock 90 to 120 feet below the natural surface. This is about the depth that bed rock is found below the surface in the business sections of Manila.

The art of constructing foundations on compressible soil was brought to a high degree of development by the architects of Chicago between 1870 and 1890. The special feature of the practice was called the method of independent piers; that is, each tier of columns, each pier and each wall had its own independent foundation, the area of which was proportioned to the load on the part.

The Opposite Extreme

The opposite extreme is to rest the structure upon a platform of concrete, timber of steel beams so strong as to resist local settlement. This method is not usually successful, it is exceedingly expensive and therefore needlessly extravagant. The post office building erected in Chicago in 1875 rested upon a bed of concrete three feet thick over the entire site, but the concrete was insufficient to resist the unequal load and the building settled so unevenly and so badly that it was necessary to demolish it after it had stood only 17 years.

The cause of unequal settlement in spread foundations is that the axis of pressure does not pass through the center of the area of foundation and the pressure per square foot is not the same for all parts of the building. In friction pile foundations the weight on each pile is not the same. This is possibly the cause of unequal settlement in Manila, throwing the building out of plumb and increasing weight on the side of the most settlement. With a foundation down to bed rock the above principle does not have to be followed but in most cases requires an unequal distribution of piles or piers for economical reasons.

New York engineers and architects decided many years ago that the only dependable foundation is one imposed on bedrock and the contractors adopted the airlock caisson method of constructing the piers.

The question is: is it not time for Manila to change from unreliable foundation design and construction, abandoned 40 or more years ago for large buildings by the principal cities of the United States, and go down to bed rock.

Cost Not Excessive

Borings show a depth to bed rock of from 90 to 120 feet through the business section of Manila with layers of sand through the clay and mud that would give lateral support to slender piers; reinforced concrete pile, steel piles or even composite piles which might be used to such a depth. The cost of such foundations is not excessive, P15 to P25, according to design of building, for each ton of dead load of the building. Equipment, material and skilled labor is at hand and there are many contractors who can do the job: Within my knowledge, however, no bids have ever been asked for such a job nor a reason given why the architects or engineers have not, so far, designed such foundations but still make questionable and unreliable designs.

Some engineers have claimed that using a spread foundation on a compressible soil cushions the building and lessens the vibration and damage from earthquake. This sounds reasonable and may be their reason for such designs, but the last severe earthquake seems to have caused such buildings to vibrate considerably, and also settle, and it is doubtful if the vibration would have been worse in a building with foundations down to rock. Engineers' studies and reports of the results of the recent damaging earthquake at Los Angeles, California, did not sustain such a theory.

Engineering Notes

TRANSPORTATION

RESTORE RAILWAY.—According to a telegram received by the General Directorate of Railways traffic between Mopanshan and Weitsukou on the Hsinking-Tumen line which had been interrupted owing to a flood, was resumed on September 14, Traffic between Zenkyori and Sohei on the Northern Korean line was also resumed on the 13th. The inundated sections of the main lines operated by the General Directorate of Railways have been all reopened except the portion of the Tumen-Chiamussu line between Santaokou and Tahuangkou which also was restored September 23.

NEW BRIDGE.—The Public Works Bureau of Fengtien Province, which has been carrying on a survey to build a large bridge over the Hunho River at the point where the projected highway to be constructed between Dairen and Hsinking crosses the river, will start work on the bridge from the middle of October and complete it in November next year, continuing its work even during the freezing season. The bridge will be 644 meters long and 9.80 meters wide, and will cross the Hunho River in a south-westerly direction. The Hunho flows between Hunho Ward in Mukden and Hunhopu in Shenyang-hsien. The cost of construction will be 930,000 yuan.

NEW MANCHOUKUO ROADS.—The General Directorate of Railways announce the opening of new motor routes from September 10 as follows:

Harbin—Acheng (45 kilometers)
Acheng—Lalin (38 kilometers)
Yushu—Lalin (59 kilometers)
Peipiao—Nimanchi (152 kilometers)
Suichungcheng—Mingshuitangpienmen (43 kilometers)
Hsinhui—Yehpaishou (115 kilometers)
Hsitientzu—Laofushan (32 kilometers)
Chiburi—Hunanying (5 kilometers)

SHANGHAI-HAIPHONG ROUTE.—Butterfield and Swire, and Jardine, Matheson, British steamship companies which have been active on the South China route since the hostilities in China began, have decided to operate freighters and passenger boats between Shanghai and Haiphong owing to the rapid increase in the quantity of cargo in and out of Haiphong in Indo-China.

The *Canton*, of Butterfield and Swire on September 9 and the *Kweishen*, of Jardine's on 10th left Shanghai for Haiphong as the first liners of the route, the former making a call at Swatow, Hongkong, Haikou and Peihai, while the latter will call at Hongkong, Haikou and Peihai.

INDUSTRIAL

ELECTRO-CHEMICAL INDUSTRY.—A plan for the establishment of an electro-chemical industry company, utilizing surplus electricity from the Sungari hydro-electric power station, the draft for which has been prepared by the authorities of the Industry Ministry of the Hsinking Government, was formally approved by the State Council at its meeting held here recently, according the a report from Hsinking. After obtaining approval from the Privy Council, concrete steps toward the establishment of the company are expected to be taken shortly.

According to the plan approved by the State Council, the projected company will engage in the manufacturing of carbide, artificial rubber, acetic acid, aceton, chlorine, ammonia, etc., by utilizing the Second Sungari Hydro-electric Power Station.

MINING

SIX CONCERNS IN NORTH CHINA.—At a recent meeting various authorities in North China to discuss questions pertaining to the establishment of subsidiary companies of the North China Development Company, it has been tentatively decided to create six coal companies by dividing the territory under the jurisdiction of the Development Company into six groups, as well as two communications and two electric power companies each in North China and the Meng Chiang district and one iron company, says a report from Peking. After referring the plan to the authorities concerned of the Planning Board, the Finance Ministry and the Commerce and Industry Ministry of the Tokyo Government, the projected companies are expected to be established simultaneously with the inauguration of the North China Development Company on October 31.

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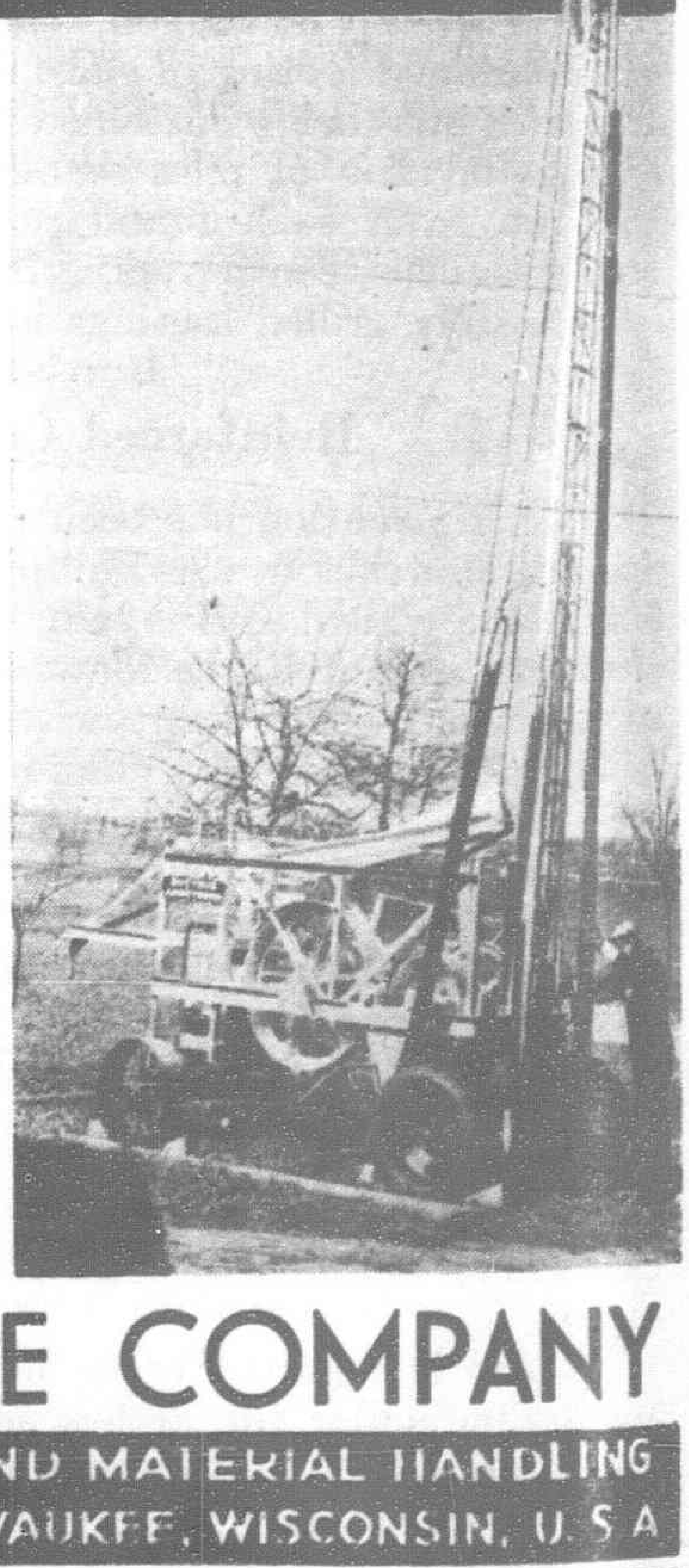

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